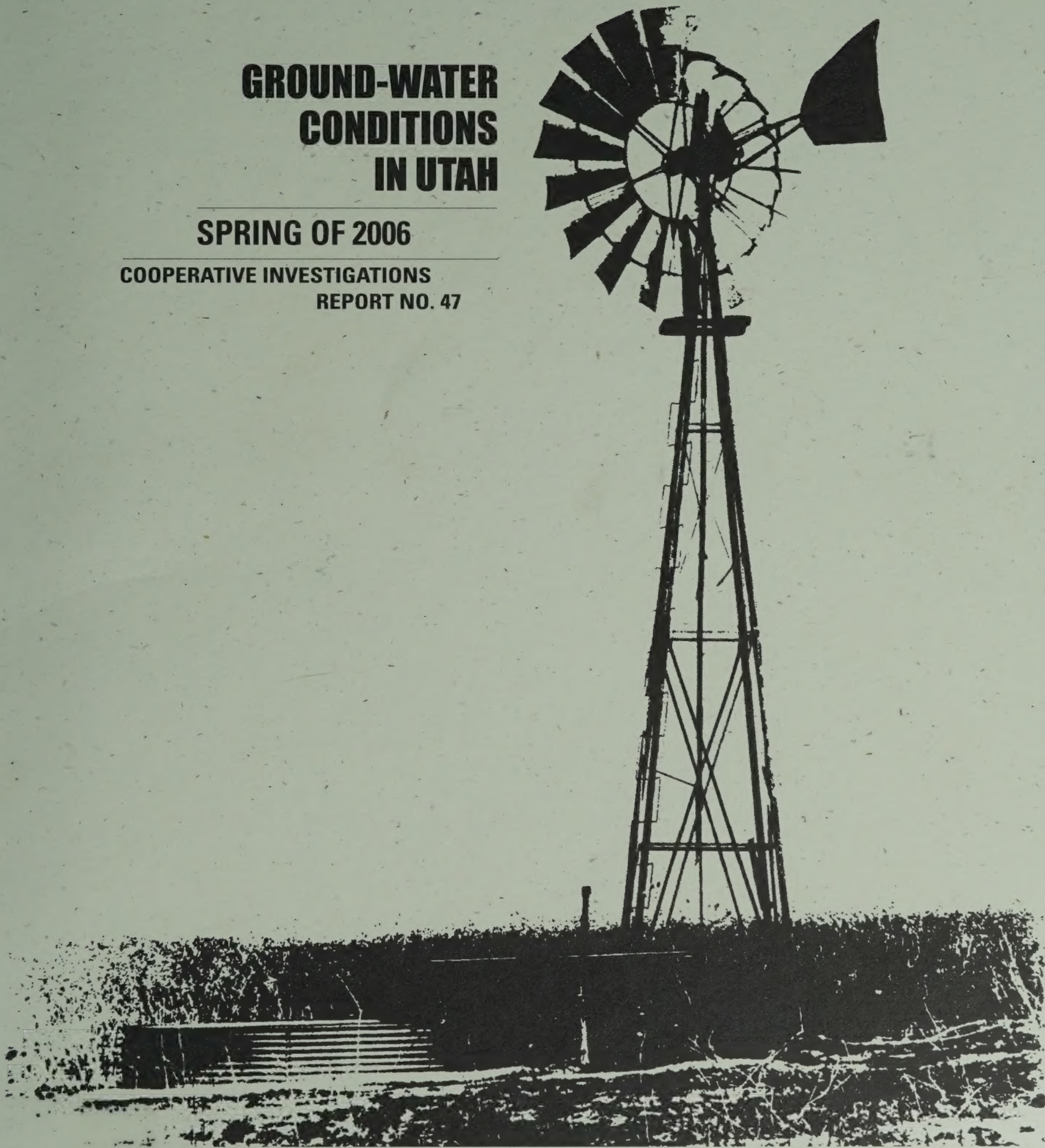
GROUND-WATER CONDITIONS IN UTAH

SPRING OF 2006

COOPERATIVE INVESTIGATIONS
REPORT NO. 47



UTAH DIVISION OF WATER RESOURCES • UTAH DIVISION OF WATER RIGHTS •
UTAH DIVISION OF WATER QUALITY

U.S. GEOLOGICAL SURVEY

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 2006

By
C.B. Burden and others
U.S. Geological Survey

Prepared by the U.S. Geological Survey
in cooperation with the Utah Department of Natural Resources,
Division of Water Resources and
Division of Water Rights; and
Utah Department of Environmental Quality, Division of Water Quality

Published by the
Utah Department of Natural Resources
Division of Water Resources
Cooperative Investigations Report Number 47
2006

Contents

Illustrations

Tables

CONVERSION FACTORS AND DATUMS

Multiply	By	To obtain
acre-foot	1,233	cubic meter
foot	0.3048	meter
gallon per minute	0.06308	liter per second
inch	25.4	millimeter
mile	1.609	kilometer
square mile	2.590	square kilometer

Vertical coordinate information is referenced to the National Geodetic Vertical Datum of 1929 (NGVD 1929). Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83).

Chemical concentration is reported only in metric units—milligrams per liter. For concentrations less than 7,000 milligrams per liter, the numerical value is about the same as for concentrations in parts per million.

DEFINITION OF TERMS

Acre-foot—The quantity of water required to cover 1 acre to a depth of 1 foot; equal to 43,560 cubic feet or about 326,000 gallons or 1,233 cubic meters.

Aquifer—A geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield substantial amounts of water to wells and springs.

Artesian—Describes a well in which the water level stands above the top of the aquifer tapped by the well (confined). A flowing artesian well is one in which the water level is above the land surface.

Cumulative departure from average annual precipitation—A graph of the departure or difference between the average annual precipitation and the value of precipitation for each year, plotted cumulatively. A cumulative plot is generated by adding the departure from average precipitation for the current year to the sum of departure values for all previous years in the period of record. A positive departure, or greater-than-average precipitation, for a year results in a graph segment trending upward; a negative departure results in a graph segment trending downward. A generally downward-trending graph for a period of years represents a period of generally less-than-average precipitation, which commonly causes and corresponds with declining water levels in wells. Likewise, a generally upward-trending graph for a period of years represents a period of greater-than-average precipitation, which commonly causes and corresponds with rising water levels in wells. However, increases or decreases in withdrawals of ground water from wells also affect water levels and can change or eliminate the correlation between water levels in wells and the graph of cumulative departure from average precipitation.

Dissolved—Material in a representative water sample that passes through a 0.45–micrometer membrane filter. This is a convenient operational definition used by Federal agencies that collect water data. Determinations of "dissolved" constituents are made on subsamples of the filtrate.

Land-surface datum (lsd)—A datum plane that is approximately at land surface at each ground-water observation well.

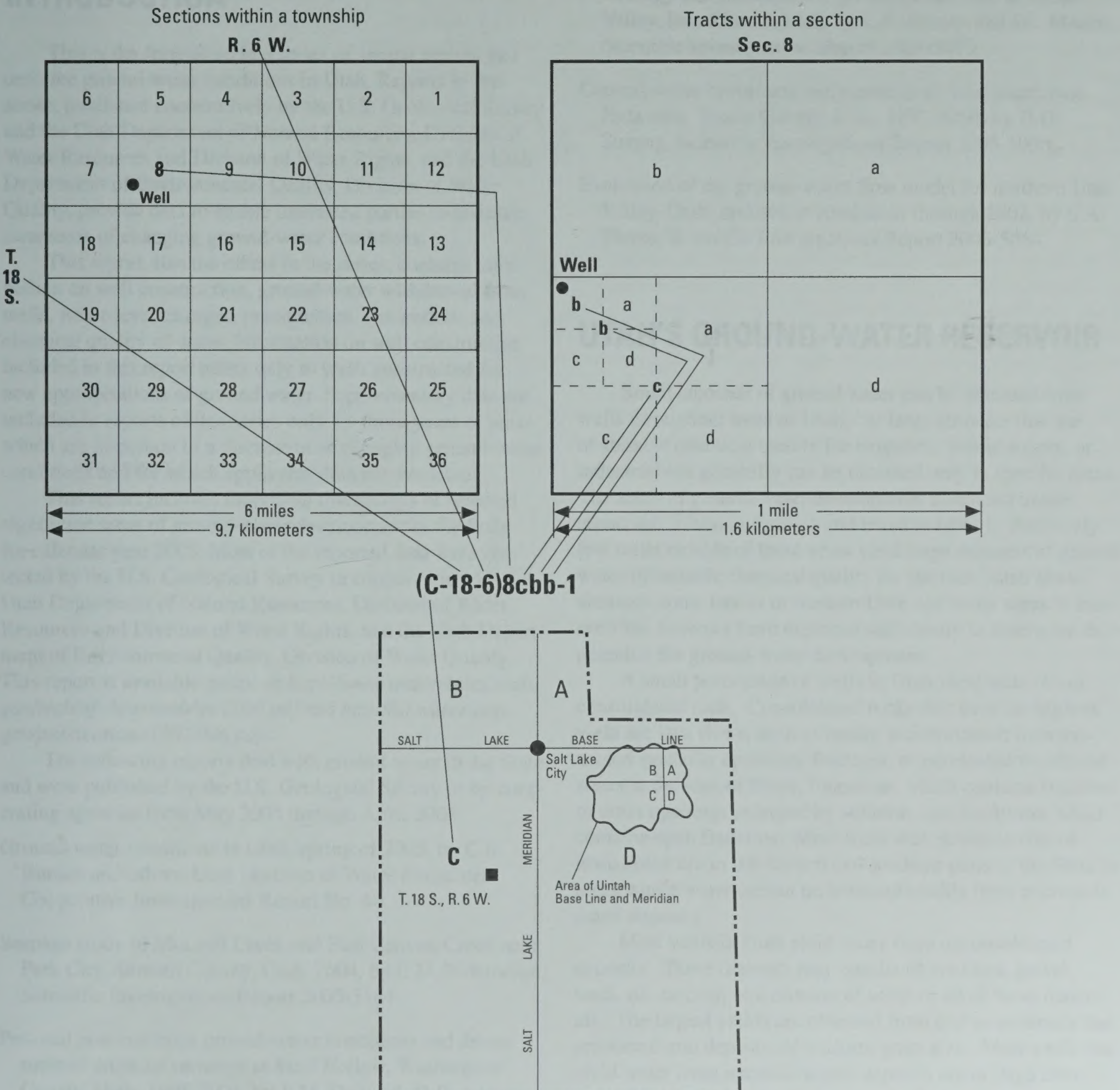
Milligrams per liter—A unit for expressing the concentration of chemical constituents in solution. Milligrams per liter represents the mass of solute per unit volume (liter) of water.

Precipitation—The total annual precipitation in inches for selected locations is computed from monthly total precipitation (rain, sleet, hail, snow, etc.). Data supplied by the National Oceanic and Atmospheric Administration (NOAA) and the Utah Climate Center. Data may be provisional and/or estimated when used to compute annual total and long-term average precipitation values.

Specific conductance—A measure of the ability of water to conduct an electrical current. It is expressed in microsiemens per centimeter at 25 degrees Celsius. Specific conductance is related to the type and concentration of ions in solution and can be used for approximating the dissolved-solids concentration of the water. Commonly, the concentration of dissolved solids (in milligrams per liter) is about 65 percent of the specific conductance (in microsiemens). This relation is not constant in water from one well or stream to another, and it may vary for the same source with changes in the composition of the water.

WELL-NUMBERING SYSTEM

The well-numbering system used in Utah is based on the Bureau of Land Management's system of land subdivision. The well-numbering system is familiar to most water users in Utah, and the well number shows the location of the well by quadrant, township, range, section, and position within the section. Well numbers for most of the State are derived from the Salt Lake Base Line and the Salt Lake Meridian. Well numbers for wells located inside the area of the Uintah Base Line and Meridian are designated in the same manner as those based on the Salt Lake Base Line and Meridian, with the addition of the "U" preceding the parentheses. The numbering system is illustrated below.



GROUND-WATER CONDITIONS IN UTAH, SPRING OF 2006

By C.B. Burden and others
U.S. Geological Survey

INTRODUCTION

This is the forty-third in a series of annual reports that describe ground-water conditions in Utah. Reports in this series, published cooperatively by the U.S. Geological Survey and the Utah Department of Natural Resources, Division of Water Resources and Division of Water Rights, and the Utah Department of Environmental Quality, Division of Water Quality, provide data to enable interested parties to maintain awareness of changing ground-water conditions.

This report, like the others in the series, contains information on well construction, ground-water withdrawal from wells, water-level changes, precipitation, streamflow, and chemical quality of water. Information on well construction included in this report refers only to wells constructed for new appropriations of ground water. Supplementary data are included in reports of this series only for those years or areas which are important to a discussion of changing ground-water conditions and for which applicable data are available.

This report includes individual discussions of selected significant areas of ground-water development in the State for calendar year 2005. Most of the reported data were collected by the U.S. Geological Survey in cooperation with the Utah Department of Natural Resources, Division of Water Resources and Division of Water Rights, and the Utah Department of Environmental Quality, Division of Water Quality. This report is available online at *http://www.waterrights.utah.gov/techinfo/wwwpub/gw2006.pdf* and *http://ut.water.usgs.gov/publications/GW2006.pdf.*

The following reports deal with ground water in the State and were published by the U.S. Geological Survey or by cooperating agencies from May 2005 through April 2006:

Ground-water conditions in Utah, spring of 2005, by C.B. Burden and others, Utah Division of Water Resources Cooperative Investigations Report No. 46.

Seepage study of McLeod Creek and East Canyon Creek near Park City, Summit County, Utah, 2004, by C.D. Wilkowske, Scientific Investigations Report 2005-5164.

Pre- and post-reservoir ground-water conditions and assessment of artificial recharge at Sand Hollow, Washington County, Utah, 1995-2005, by V.M. Heilweil, D.D. Susong, P.M. Gardner, and D.E. Watt, Scientific Investigations Report 2005-5185.

Hydrology and simulation of ground-water flow in Cedar Valley, Iron County, Utah, by L.E. Brooks and J.L. Mason, Scientific Investigations Report 2005-5170.

Ground-water movement and nitrate in ground water, east Erda area, Tooele County, Utah, 1997-2000, by D.D. Susong, Scientific Investigations Report 2005-5096.

Evaluation of the ground-water flow model for northern Utah Valley, Utah, updated to conditions through 2002, by S.A. Thiros, Scientific Investigations Report 2006-5064.

UTAH'S GROUND-WATER RESERVOIR

Small amounts of ground water can be obtained from wells throughout most of Utah, but large amounts that are of suitable chemical quality for irrigation, public supply, or industrial use generally can be obtained only in specific areas. The areas of ground-water development discussed in this report are shown in figure 1 and listed in table 1. Relatively few wells outside of these areas yield large amounts of ground water of suitable chemical quality for the uses listed above, although some basins in western Utah and many areas in eastern Utah have not been explored sufficiently to determine their potential for ground-water development.

A small percentage of wells in Utah yield water from consolidated rock. Consolidated rocks that have the highest yield are lava flows, such as basalt, which contain interconnected vesicular openings, fractures, or permeable weathered zones at the tops of flows; limestone, which contains fractures or other openings enlarged by solution; and sandstone, which contains open fractures. Most wells that penetrate consolidated rock are in the eastern and southern parts of the State in areas where water cannot be obtained readily from unconsolidated deposits.

Most wells in Utah yield water from unconsolidated deposits. These deposits may consist of boulders, gravel, sand, silt, or clay, or a mixture of some or all of these materials. The largest yields are obtained from coarse materials that are sorted into deposits of uniform grain size. Most wells that yield water from unconsolidated deposits are in large intermountain basins that have been partly filled with rock material eroded from adjacent mountains.

SUMMARY OF CONDITIONS

The total estimated withdrawal of water from wells in Utah during 2005 was about 777,000 acre-feet (table 2), which is about 149,000 acre-feet less than the total for 2004 and 81,000 acre-feet less than the 1995-2004 average annual withdrawal (table 3). The decrease in withdrawals mostly resulted from decreased irrigation. The total estimated withdrawal for irrigation was about 428,000 acre-feet, which is 108,000 acre-feet less than the value for 2004. Withdrawal for industrial use decreased about 8,000 acre-feet to about 69,000 acre-feet. Withdrawal for public supply was about 212,000 acre-feet, which is about 29,000 acre-feet less than the value for 2004. Withdrawal for domestic and stock use was about 66,000 acre-feet, which is about 6,000 acre-feet less than the value for 2004.

Ground-water withdrawal decreased from 2004 to 2005 in 13 of the 16 areas of ground-water development discussed in this report (table 2). Withdrawal in the Beryl-Enterprise area decreased about 30,000 acre-feet, the largest decrease of the ground-water development areas (fig. 1). The 2005 withdrawal was more than the average annual withdrawal for 1995-2004 in 10 of the 16 areas (tables 2 and 3).

The amount of water withdrawn from wells is related to demand and availability of water from other sources, which, in turn, are partly related to local climatic conditions. Precipitation during calendar year 2005 at 24 of 28 weather stations included in this report (National Oceanic and Atmospheric Administration, 2005), was greater than the long-term average. The greatest increase in precipitation from average was 11.2 inches at Pine View dam. The greatest decrease in precipitation from average was 1.3 inches at Heber City.

About 650 water-level measurements were made during February and March 2006 in wells for areas included in this report. Water-level data are available online at *http://waterdata.usgs.gov/ut/nwis/gwlevels*.

In 2005, 564 wells were constructed for new appropriations of ground water, as determined by the Utah Division of Water Rights (table 2), which is 39 more wells than the total reported for 2004.[1] In 2005, 14 large-diameter wells (12 inches or more) were constructed for new appropriations of ground water (table 2). These are principally for withdrawal of water for public supply, irrigation, and industrial use.

[1]Prior to 2004, total includes some monitoring wells.

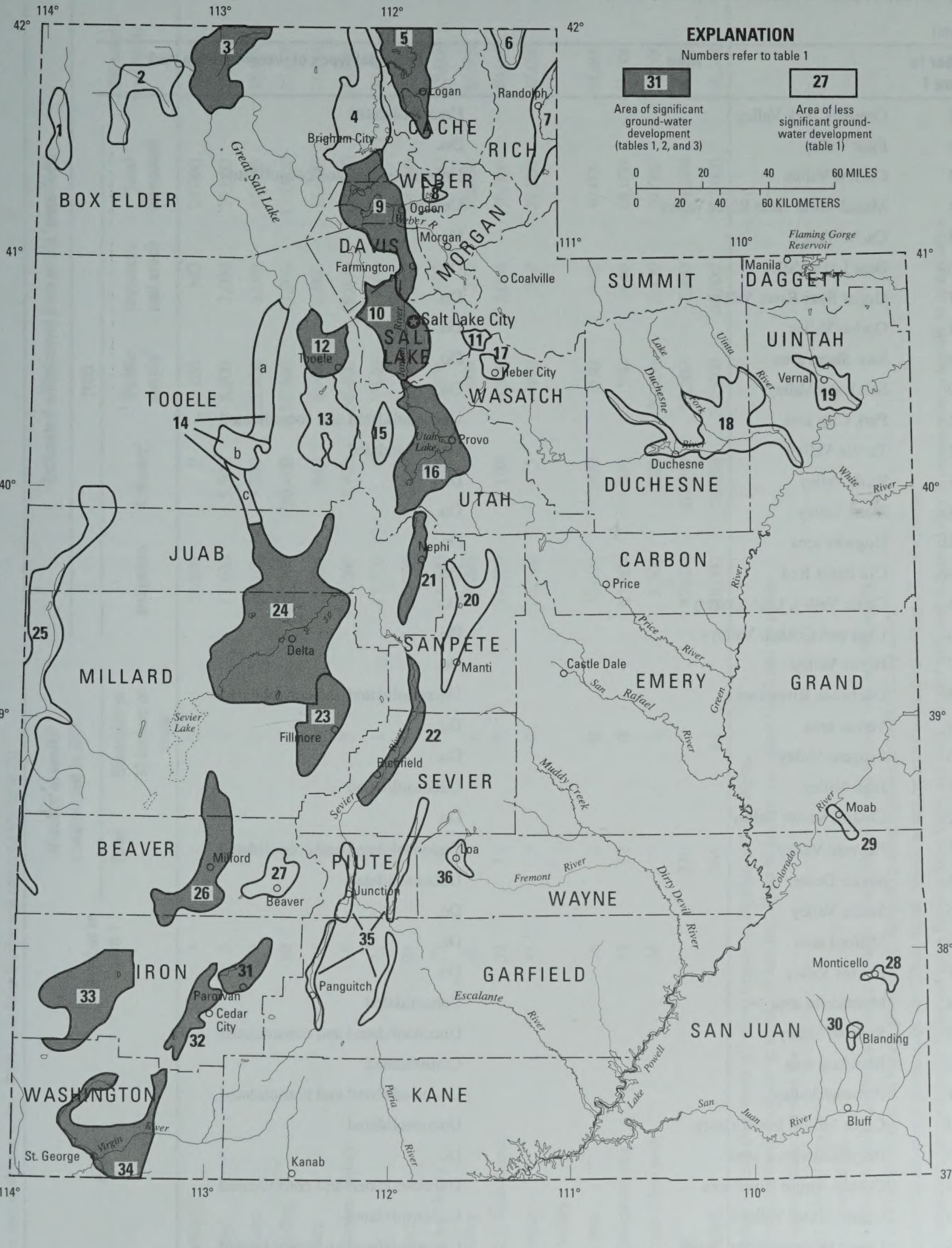


Figure 1. Areas of ground-water development in Utah specifically referred to in this report.

Table 1. Areas of ground-water development in Utah specifically referred to in this report

[Do., ditto]

Number in figure 1	Area	Principal types of water-bearing rock
1	Grouse Creek Valley	Unconsolidated
2	Park Valley	Do.
3	Curlew Valley	Unconsolidated and consolidated
4	Malad-lower Bear River Valley	Unconsolidated
5	Cache Valley	Do.
6	Bear Lake Valley	Do.
7	Upper Bear River Valley	Do.
8	Ogden Valley	Do.
9	East Shore area	Do.
10	Salt Lake Valley	Do.
11	Park City area	Unconsolidated and consolidated
12	Tooele Valley	Unconsolidated
13	Rush Valley	Do.
14a	Skull Valley	Do.
14b	Dugway area	Do.
14c	Old River Bed	Do.
15	Cedar Valley, Utah County	Do.
16	Utah and Goshen Valleys	Do.
17	Heber Valley	Do.
18	Duchesne River area	Unconsolidated and consolidated
19	Vernal area	Do.
20	Sanpete Valley	Do.
21	Juab Valley	Unconsolidated
22	Central Sevier Valley	Do.
23	Pahvant Valley	Unconsolidated and consolidated
24	Sevier Desert	Unconsolidated
25	Snake Valley	Do.
26	Milford area	Do.
27	Beaver Valley	Do.
28	Monticello area	Consolidated
29	Spanish Valley	Unconsolidated and consolidated
30	Blanding area	Consolidated
31	Parowan Valley	Unconsolidated and consolidated
32	Cedar Valley, Iron County	Unconsolidated
33	Beryl-Enterprise area	Do.
34	Central Virgin River area	Unconsolidated and consolidated
35	Upper Sevier Valleys	Unconsolidated
36	Upper Fremont River Valley	Unconsolidated and consolidated

Table 2. Number of wells constructed and estimated withdrawal of water from wells in Utah

[Estimated withdrawal from wells—2004 total: from Burden and others (2005, table 2)]

Area	Number in figure 1	Number of wells[1] constructed in 2005		Estimated withdrawal from wells (acre-feet)					
				2005					2004 total (rounded)
		Total	Diameter of 12 inches or more	Irrigation	Industry[1]	Public supply[1]	Domestic and stock	Total (rounded)	
Curlew Valley	3	1	0	28,600	0	200	100	29,000	38,000
Cache Valley	5	38	0	12,600	5,500	8,900	2,000	29,000	27,000
East Shore area	9	7	0	10,100	3,300	22,800	5,000	41,000	46,000
Salt Lake Valley	10	26	4	800	[2]20,400	65,400	23,000	110,000	125,000
Tooele Valley	12	36	0	[3]9,000	640	6,900	1,000	18,000	21,000
Utah and Goshen Valleys	16	51	3	47,000	4,700	38,400	19,600	110,000	128,000
Juab Valley	21	4	1	13,500	0	[4]540	400	14,000	26,000
Sevier Desert	24	8	0	16,200	4,800	1,400	1,200	24,000	41,000
Central Sevier Valley	22	18	1	13,000	90	3,000	980	17,000	15,000
Pahvant Valley	23	6	1	79,000	0	890	320	80,000	85,000
Cedar Valley, Iron County	32	13	0	21,100	100	6,300	2,000	30,000	40,000
Parowan Valley	31	5	0	[5]26,500	15	490	310	27,000	37,000
Escalante Valley									
Milford area	26	2	0	31,400	[6]7,900	630	140	40,000	44,000
Beryl-Enterprise area	33	12	0	65,500	[7]1,700	500	640	68,000	98,000
Central Virgin River area	34	7	2	5,900	200	20,200	2,400	29,000	26,000
Other areas[8,9]		330	2	47,600	20,600	35,300	7,300	111,000	129,000
Total (rounded)		564	14	428,000	70,000	212,000	66,000	777,000	926,000

[1] Data provided by Utah Department of Natural Resources, Division of Water Rights.

[2] Includes some use for air conditoning, about 330 acre-feet. About 95 percent was injected back into the aquifer.

[3] Includes some domestic and stock use.

[4] Previously included some springs.

[5] Includes some stock use.

[6] Includes 5,940 acre-feet for geothermal power generation. About 99 percent was injected back into the aquifer.

[7] Includes 1,440 acre-feet used for heating greenhouses. About 95 percent was injected back into the aquifer.

[8] Withdrawal totals are estimated minimum. See "Other Areas" section of this report for withdrawal estimates for other areas.

[9] Includes withdrawals for upper Sevier Valley and upper Fremont River Valley that were included with central Sevier Valley in reports prior to number 31 of this series.

Table 3. Total annual withdrawal of water from wells in significant areas of ground-water development in Utah, 1995-2004

[From previous reports of this series]

Area	Number in figure 1	Thousands of acre-feet (rounded)										1995-2004 average (rounded)
		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	
Curlew Valley	3	31	39	36	29	29	41	36	[1]38	42	38	36
Cache Valley	5	23	24	25	26	24	30	32	33	27	27	27
East Shore area	9	53	57	62	56	61	60	57	49	49	46	55
Salt Lake Valley	10	120	138	123	122	126	145	151	[1]140	130	125	132
Tooele Valley	12	26	23	25	[1]19	21	24	21	21	22	21	22
Utah and Goshen Valleys	16	77	99	96	86	[1]110	132	128	133	130	128	112
Juab Valley	21	13	19	15	12	14	27	29	29	27	26	21
Sevier Desert	24	18	17	17	12	12	15	19	36	28	41	22
Central Sevier Valley	22	20	21	20	20	20	13	12	11	15	15	17
Pahvant Valley	23	69	83	67	66	76	80	80	89	86	85	78
Cedar Valley, Iron County	32	31	35	34	36	32	[1]35	32	42	39	40	36
Parowan Valley	31	24	29	25	28	[1]26	30	[1]33	39	31	37	30
Escalante Valley												
Milford area	26	48	52	52	41	41	49	42	52	50	44	47
Beryl-Enterprise area	33	70	92	81	74	79	84	81	99	92	98	85
Central Virgin River area	34	15	17	18	20	[1]18	[1]26	27	27	28	26	22
Other areas		97	113	107	99	106	[1]135	114	131	128	129	116
Total (rounded)		735	858	803	[1]746	[1]795	[1]926	[1]894	[1]969	924	926	858

[1] Revised.

MAJOR AREAS OF GROUND-WATER DEVELOPMENT

CURLEW VALLEY

By David V. Allen

The Curlew Valley drainage basin extends across the Utah-Idaho State line between latitudes 41°40' and 42°30' north and longitudes 112°30' and 113°20' west, and covers about 1,200 square miles. The valley is bounded on the west, north, and east by mountains that range in altitude from about 6,500 to nearly 10,000 feet and is open to the south, where water draining from the valley enters Great Salt Lake.

The Utah part of Curlew Valley (Utah subbasin) covers about 550 square miles. It is an arid to semiarid, largely uninhabited area, with a community center at Snowville. Average annual precipitation in the Utah subbasin is less than 8 inches on the valley floor and reaches a maximum that exceeds 35 inches on one of the highest mountain peaks.

The principal source of water in the Utah subbasin is ground water. The ground-water reservoir is primarily composed of confined aquifers in alluvial and lacustrine deposits and volcanic rocks. These formations yield several hundred to several thousand gallons of water per minute to individual large-diameter irrigation wells west of Snowville and near Kelton.

Total estimated withdrawal of water from wells in Curlew Valley in 2005 was about 29,000 acre-feet, which is 9,000 acre-feet less than the value for 2004 and 7,000 acre-feet less than the average annual withdrawal for 1995-2004 (tables 2 and 3).

The location of wells in Curlew Valley in which the water level was measured during March 2006 is shown in figure 2. The relation of the water level in selected observation wells to cumulative departure from average annual precipitation at Grouse Creek, to annual withdrawal from wells, and to concentration of dissolved solids in water from selected wells is shown in figure 3.

Water levels in Curlew Valley generally rose from March 2005 to March 2006. These recent rises probably resulted from greater-than-average precipitation and streamflow, and decreased pumpage in 2005.

Precipitation at Grouse Creek in 2005 was about 17.8 inches, which is about 5.8 inches more than the revised precipitation for 2004 (12.0 inches) and about 6.5 inches more than the average annual precipitation for 1959-2005.

The concentration of dissolved solids in water from well (B-12-11)4bcc-1, north of Kelton, has generally increased since 1972. The concentration of dissolved solids in water from well (B-14-9)5bbb-1, west of Snowville, increased from about 320 milligrams per liter in 1972 to about 640 milligrams per liter in 2005. These increases may be a result of recharge from unconsumed irrigation water in which dissolved solids are concentrated by evaporation.

Physical properties and results of chemical analyses for water from two wells in Curlew Valley are listed tables 4 and 5 and the location of the wells is plotted in figure 39. The concentration of dissolved chloride was 1,420 milligrams per liter in water from well (B-12-11) 4bcc-1, which was the highest observed concentration of any of the samples collected. Water from this well also had the highest observed specific-conductance value, 4,830 microsiemens per centimeter at 25 degrees Celsius.

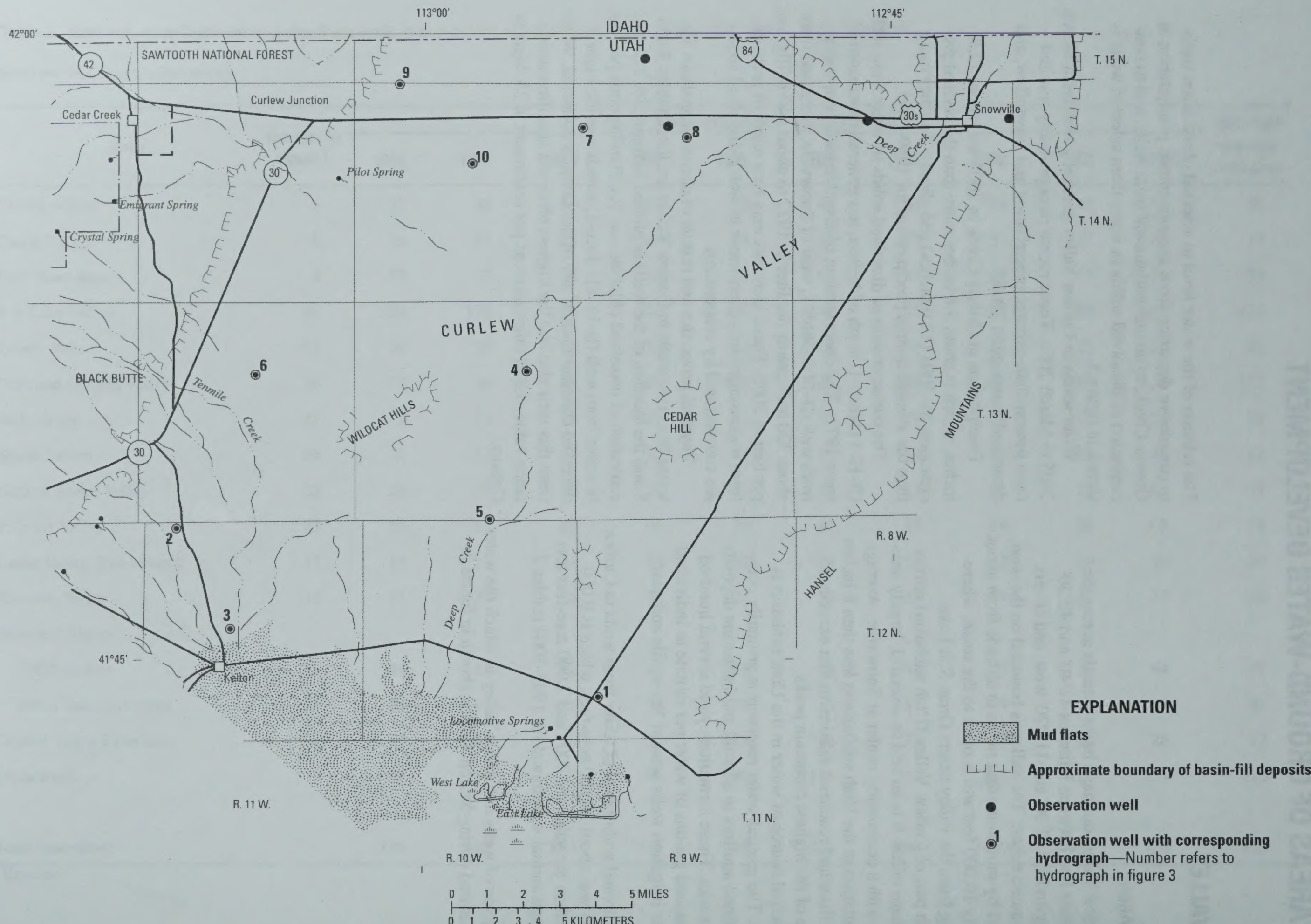


Figure 2. Location of wells in Curlew Valley in which the water level was measured during March 2006.

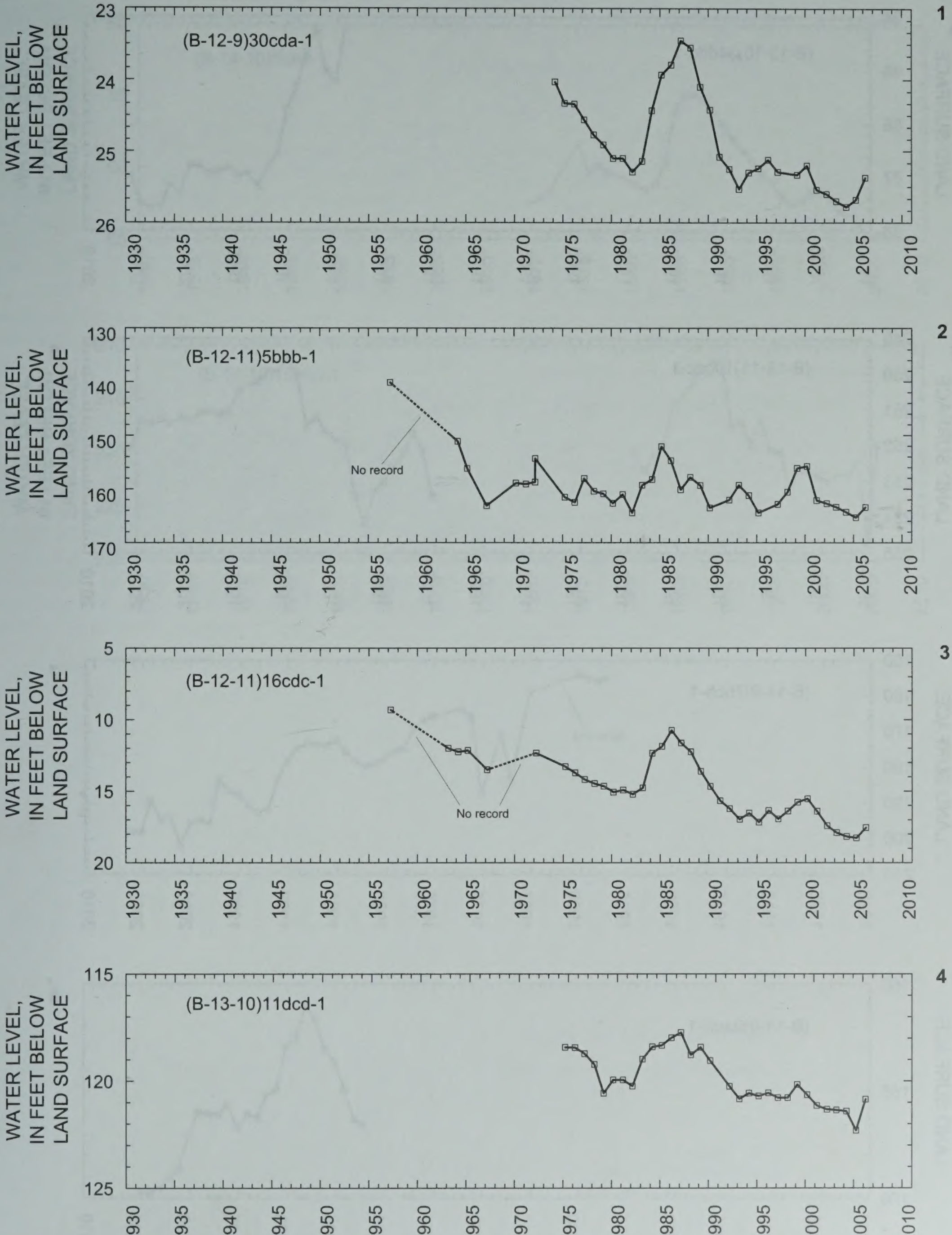


Figure 3. Relation of water level in selected wells in Curlew Valley to cumulative departure from average annual precipitation at Grouse Creek, to annual withdrawal from wells, and to concentration of dissolved solids in water from selected wells.

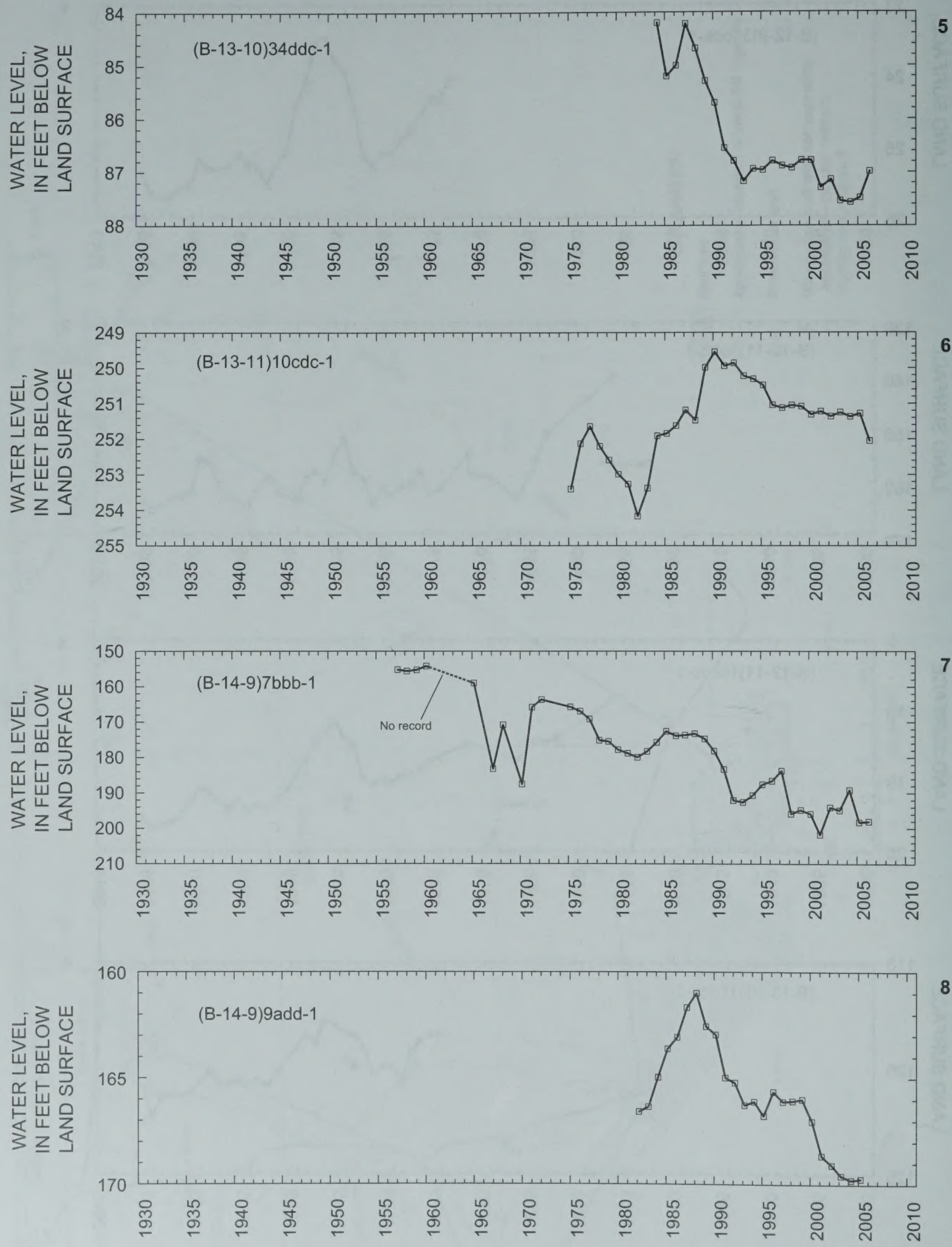


Figure 3. Relation of water level in selected wells in Curlew Valley to cumulative departure from average annual precipitation at Grouse Creek, to annual withdrawal from wells, and to concentration of dissolved solids in water from selected wells—Continued.

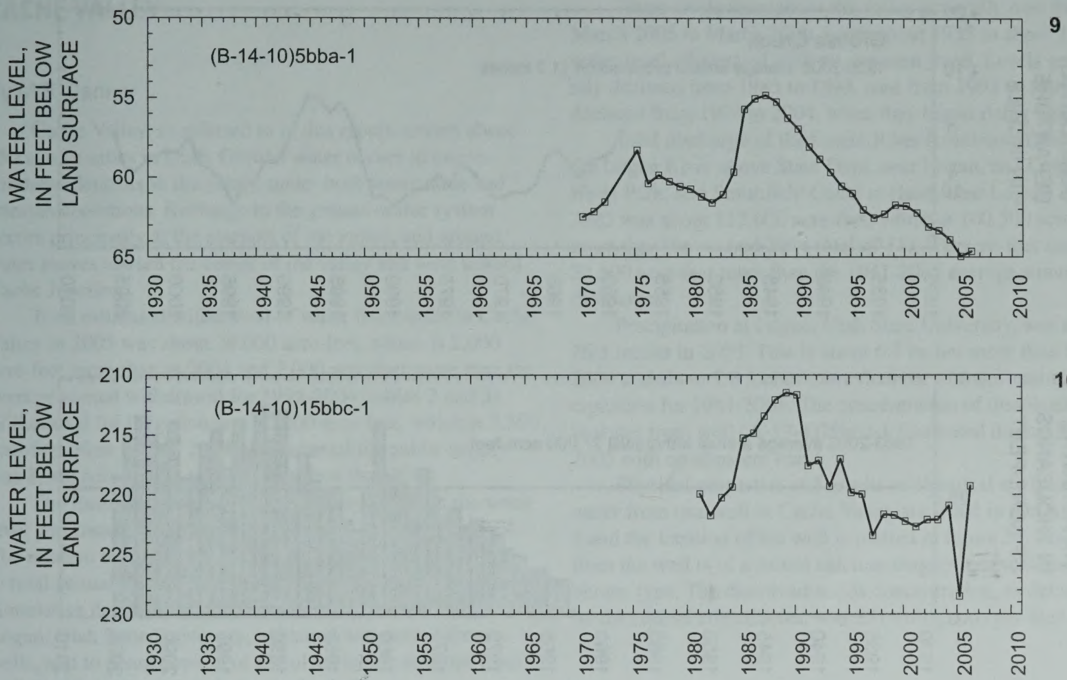


Figure 3. Relation of water level in selected wells in Curlew Valley to cumulative departure from average annual precipitation at Grouse Creek, to annual withdrawal from wells, and to concentration of dissolved solids in water from selected wells—Continued.

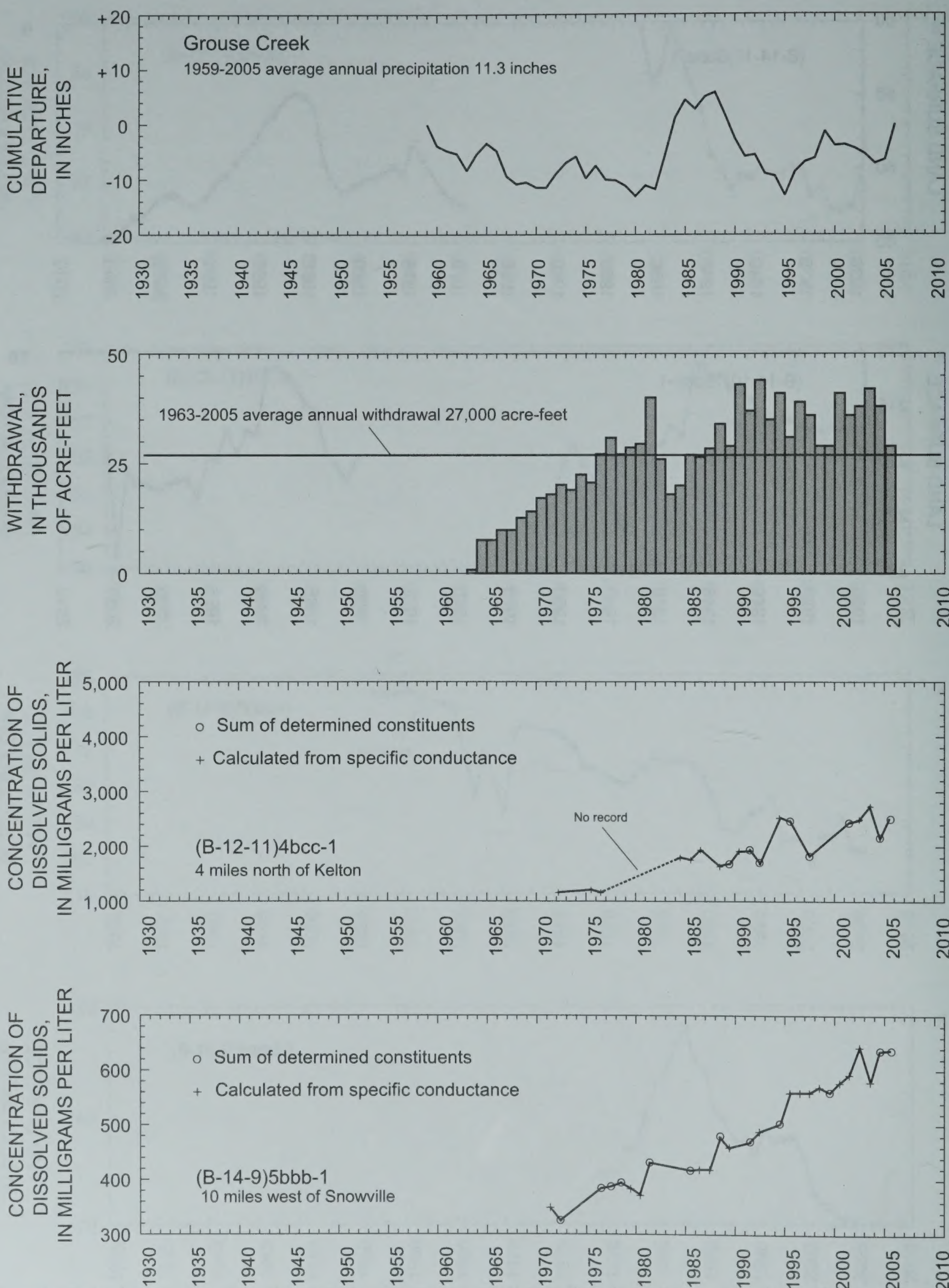


Figure 3. Relation of water level in selected wells in Curlew Valley to cumulative departure from average annual precipitation at Grouse Creek, to annual withdrawal from wells, and to concentration of dissolved solids in water from selected wells—Continued.

CACHE VALLEY

By M.R. Danner

Cache Valley, as referred to in this report, covers about 450 square miles in Utah. Ground water occurs in unconsolidated deposits in the valley, under both water-table and artesian conditions. Recharge to the ground-water system occurs principally at the margins of the valley, and ground water moves toward the center of the valley and west toward Cache Junction.

Total estimated withdrawal of water from wells in Cache Valley in 2005 was about 29,000 acre-feet, which is 2,000 acre-feet more than in 2004 and 2,000 acre-feet more than the average annual withdrawal for 1995-2004 (tables 2 and 3). Withdrawal for irrigation was 12,600 acre-feet, which is 3,300 acre-feet more than in 2004. Withdrawal for public supply was 8,900 acre-feet, 1,600 acre-feet less than 2004.

The location of wells in Cache Valley in which the water level was measured during March 2006 is shown in figure 4. The relation of the water level in selected observation wells to total annual discharge of the Logan River near Logan, to cumulative departure from average annual precipitation at Logan, Utah State University, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (A-13-1)29bcd-1 is shown in figure 5.

Water levels throughout the valley generally rose from March 2005 to March 2006. From about 1935 to about 1983 water levels fluctuated with no apparent trend. Levels generally declined from 1985 to 1993, rose from 1993 to 1999, and declined from 1999 to 2004, when they began rising again.

Total discharge of the Logan River (combined flow from the Logan River above State Dam, near Logan, and Logan, Hyde Park, and Smithfield Canal at Head, near Logan) during 2005 was about 212,600 acre-feet, which is 100,500 acre-feet more than the revised 2004 total of 112,100 acre-feet and 32,500 acre-feet more than the 1941-2005 average annual discharge.

Precipitation at Logan, Utah State University, was about 26.5 inches in 2005. This is about 6.7 inches more than for 2004 and about 7.8 inches more than the average annual precipitation for 1941-2005. The concentration of dissolved solids in water from well (A-13-1)29bcd-1 fluctuated during 1970-2005 with no apparent trend.

Physical properties and results of chemical analyses for water from one well in Cache Valley are listed in tables 4 and 5 and the location of the well is plotted in figure 39. Water from the well is of a mixed calcium magnesium sodium bicarbonate type. The dissolved-solids concentration, as determined by the sum of constituents, was 231 milligrams per liter.

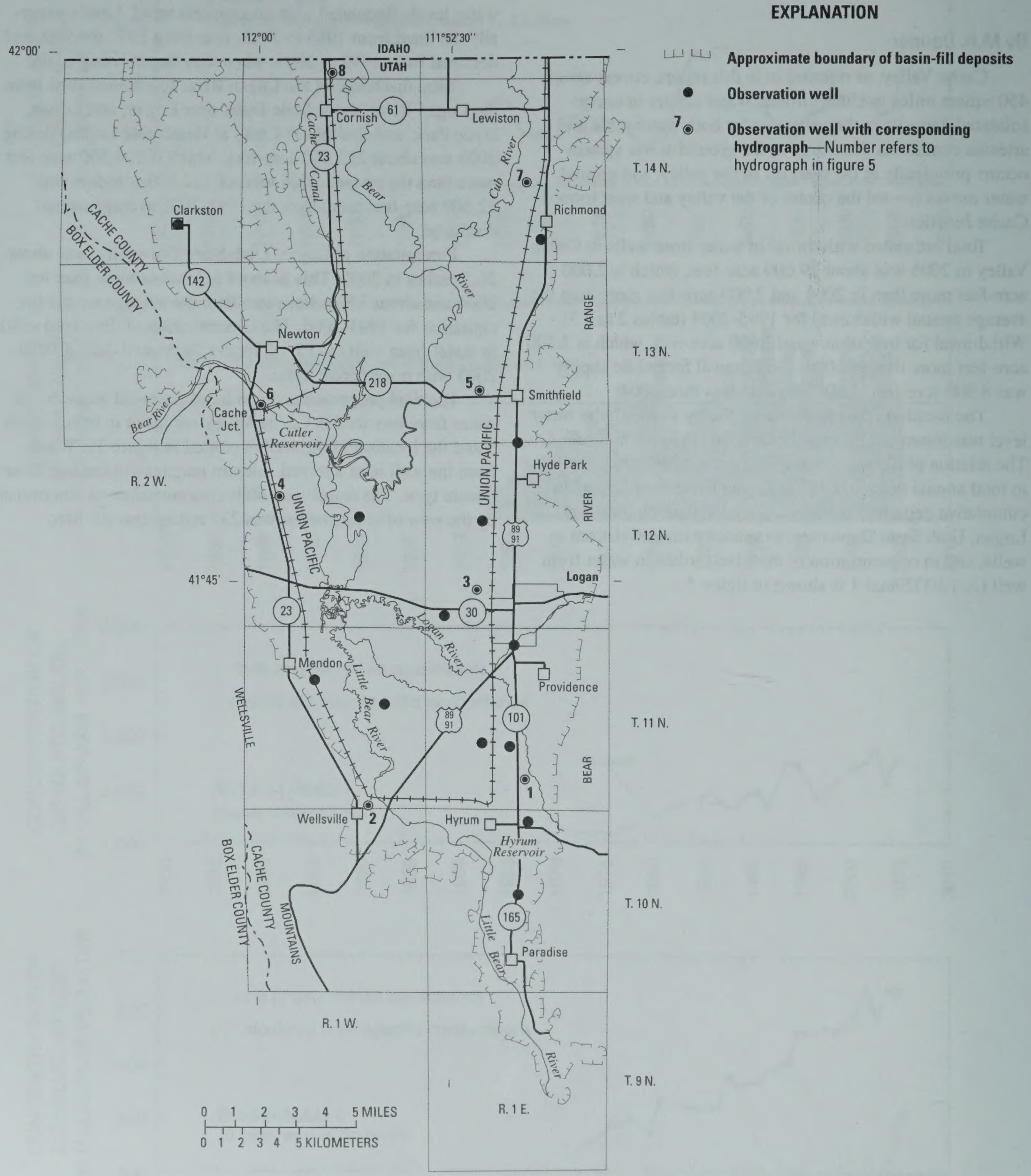


Figure 4. Location of wells in Cache Valley in which the water level was measured during March 2006.

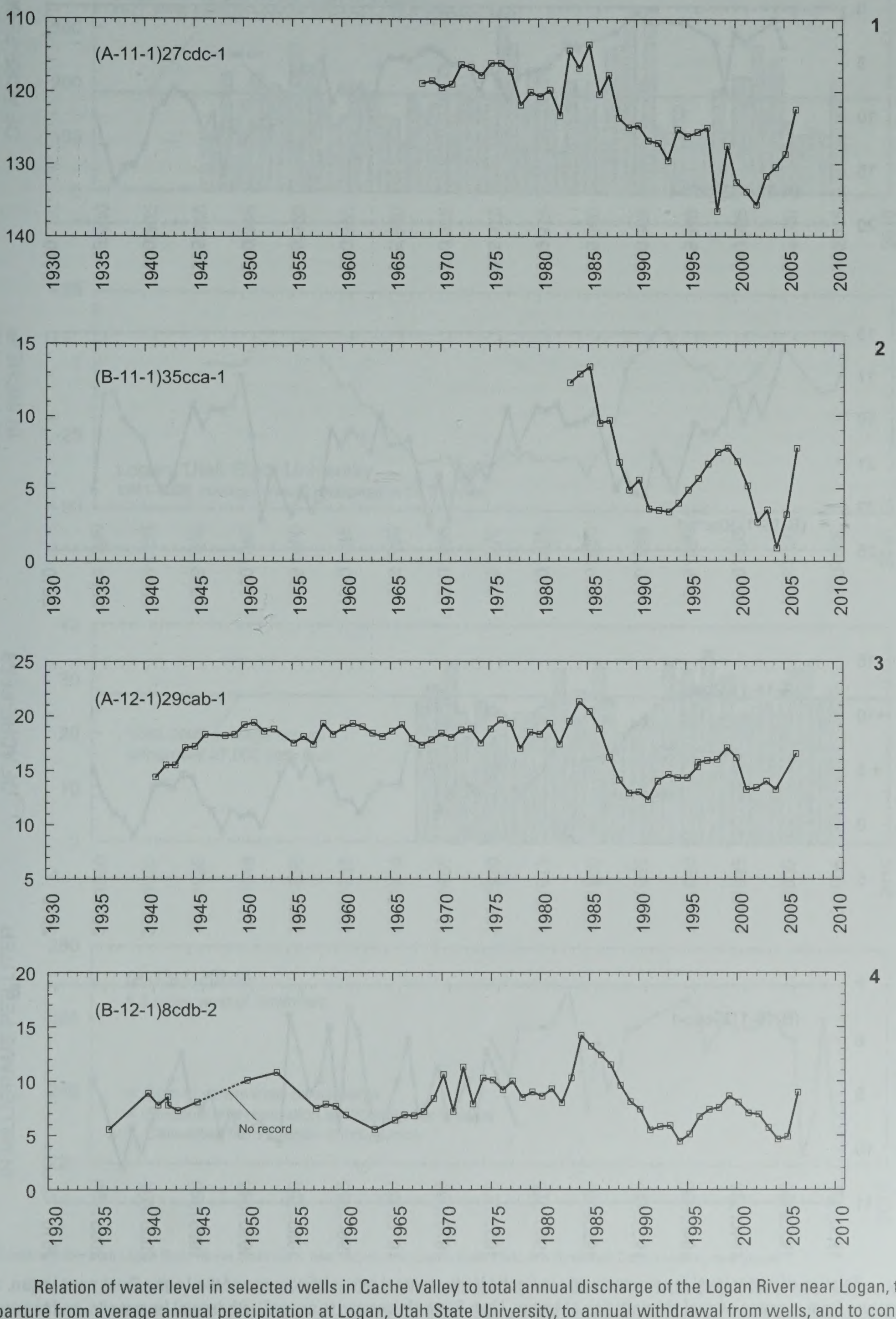


Figure 5. Relation of water level in selected wells in Cache Valley to total annual discharge of the Logan River near Logan, to cumulative departure from average annual precipitation at Logan, Utah State University, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (A-13-1)29bcd-1.

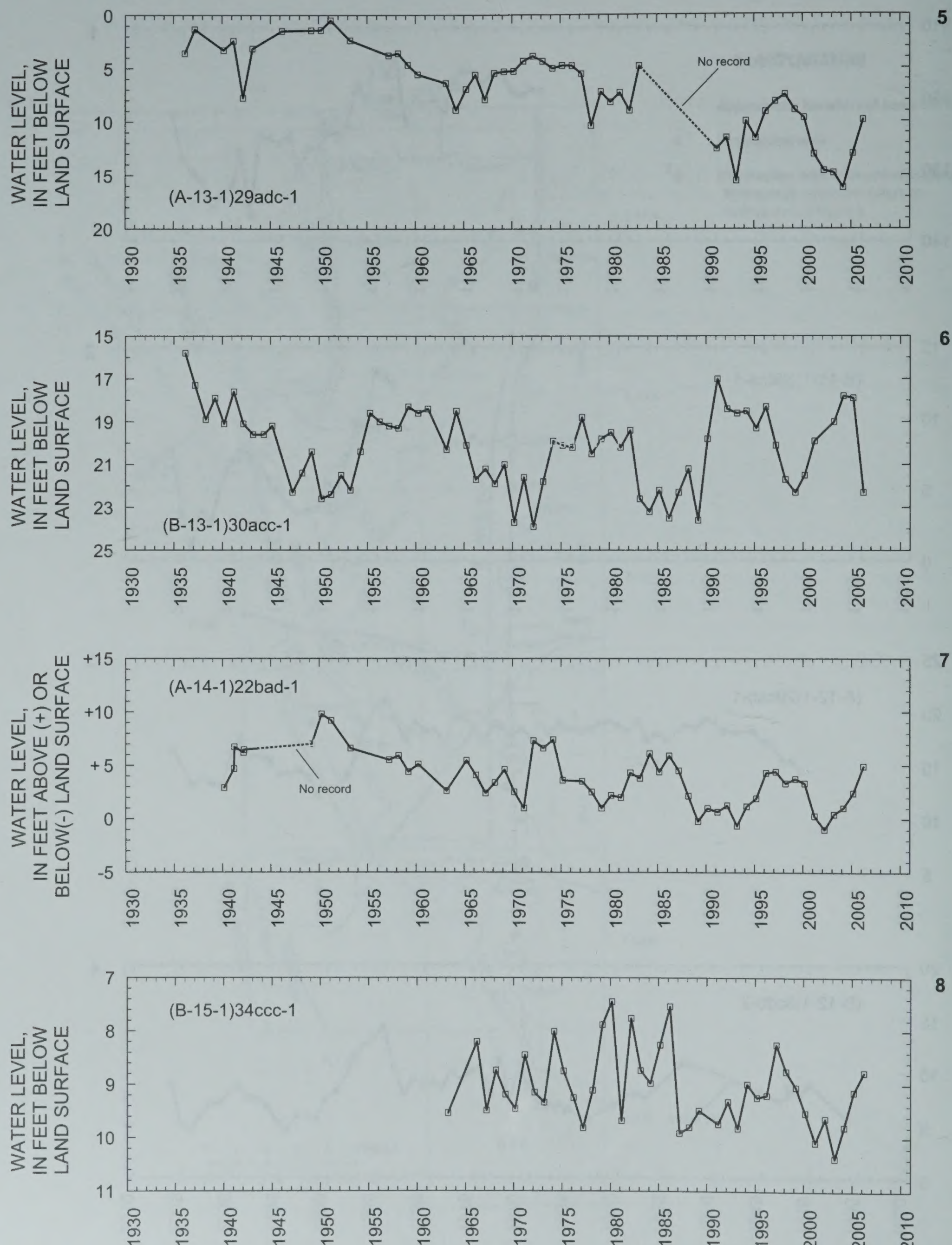
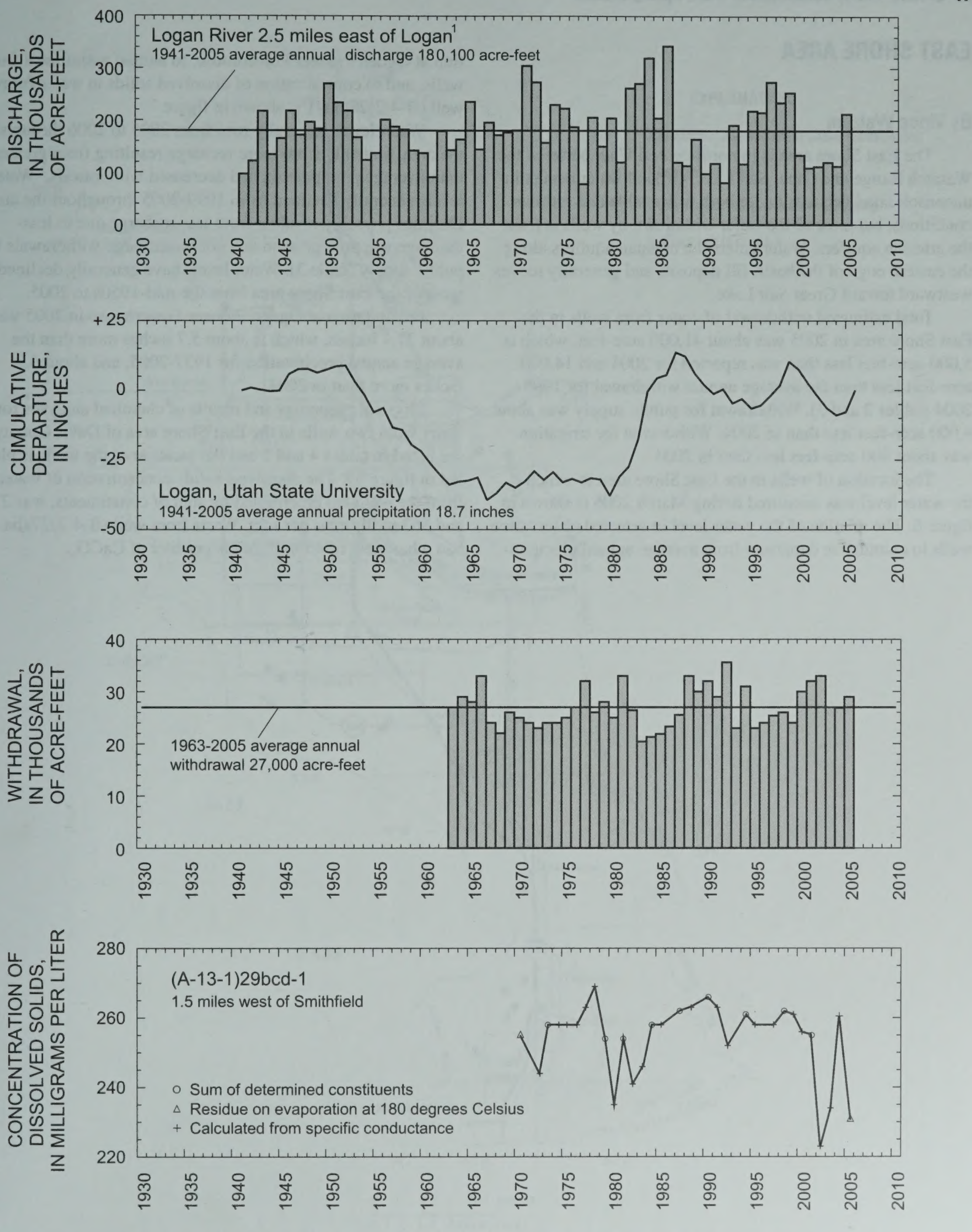


Figure 5. Relation of water level in selected wells in Cache Valley to total annual discharge of the Logan River near Logan, to cumulative departure from average annual precipitation at Logan, Utah State University, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (A-13-1)29bcd-1—Continued.



[1] Combined flow from Logan River above State Dam, near Logan, and Logan, Hyde Park, and Smithfield Canal at Head, near Logan.

Figure 5. Relation of water level in selected wells in Cache Valley to total annual discharge of the Logan River near Logan, to cumulative departure from average annual precipitation at Logan, Utah State University, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (A-13-1)29bcd-1—Continued.

EAST SHORE AREA

By Vince Walzem

The East Shore area is in north-central Utah between the Wasatch Range and Great Salt Lake. Ground water occurs in unconsolidated deposits under both water-table and artesian conditions, but most of the water withdrawn by wells is from the artesian aquifers. Water enters the artesian aquifers along the eastern edge of the basin-fill deposits and generally moves westward toward Great Salt Lake.

Total estimated withdrawal of water from wells in the East Shore area in 2005 was about 41,000 acre-feet, which is 5,000 acre-feet less than was reported for 2004 and 14,000 acre-feet less than the average annual withdrawal for 1995-2004 (tables 2 and 3). Withdrawal for public supply was about 4,000 acre-feet less than in 2004. Withdrawal for irrigation was about 800 acre-feet less than in 2004.

The location of wells in the East Shore area in which the water level was measured during March 2006 is shown in figure 6. The relation of the water level in selected observation wells to cumulative departure from average annual precipitation at Ogden Pioneer Powerhouse, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (B-4-2)27aba-1 is shown in figure 7.

Water levels generally rose from 2005 to 2006 throughout the area, probably from more recharge resulting from greater-than-average precipitation and decreased withdrawals. Water levels generally declined from 1999-2005 throughout the area. Declines probably resulted from less recharge due to less-than-average precipitation and continued large withdrawals for public supply (table 3). Water levels have generally declined in most of the East Shore area from the mid-1950s to 2005.

Precipitation at Ogden Pioneer Powerhouse in 2005 was about 27.4 inches, which is about 5.7 inches more than the average annual precipitation for 1937-2005, and about 6.9 inches more than in 2004.

Physical properties and results of chemical analyses for water from two wells in the East Shore area of Davis County are listed in tables 4 and 5 and the location of the wells is plotted in figure 39. The dissolved-solids concentration of water from the wells, as determined by sum of constituents, was 275 and 363 milligrams per liter. Water from well (B-4-2)27aba-1 had a hardness of 45 milligrams per liter of $CaCO_3$.

Figure 6. Location of wells in the East Shore area in which the water level was measured during March 2006.

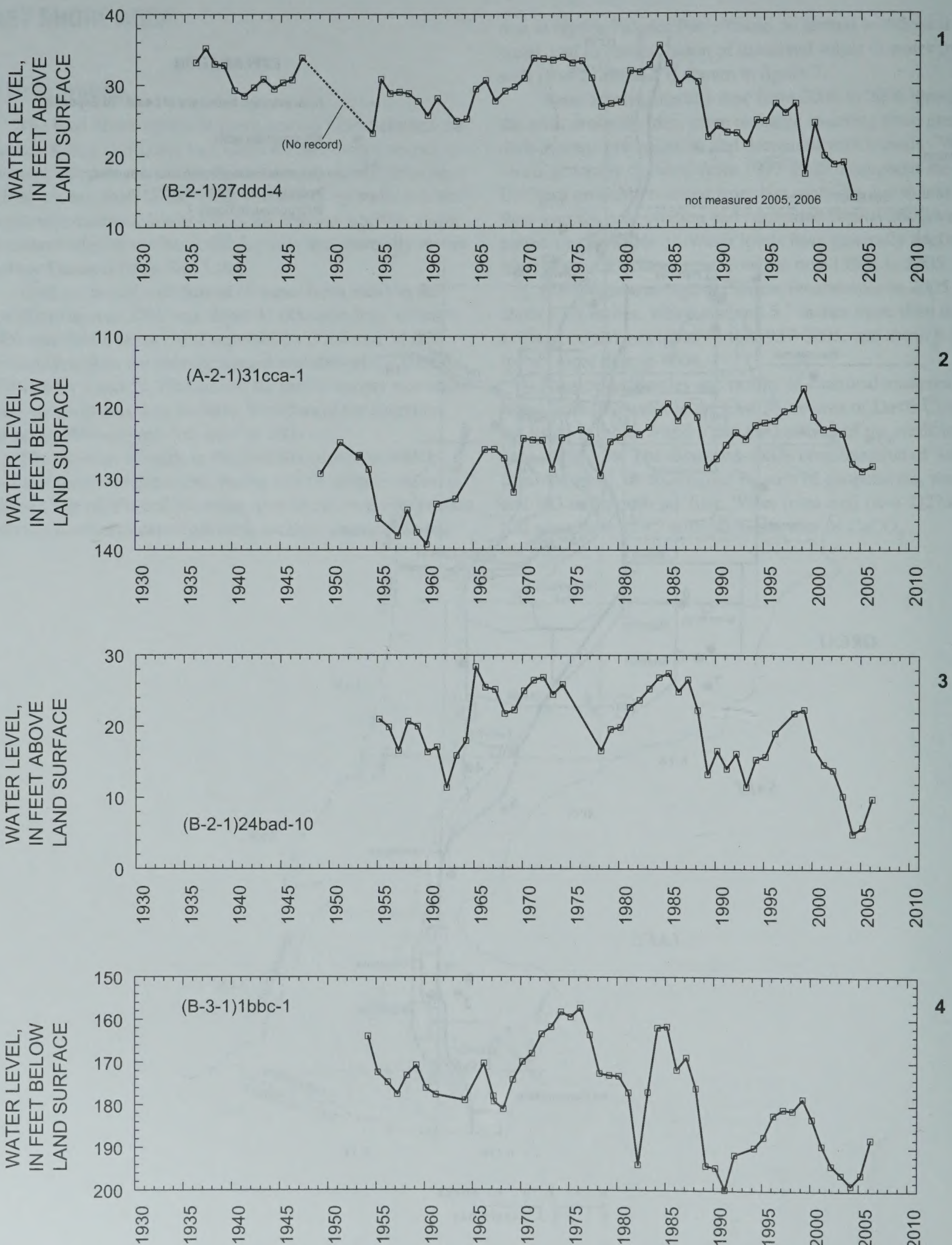


Figure 7. Relation of water level in selected wells in the East Shore area to cumulative departure from average annual precipitation at Ogden Pioneer Powerhouse, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (B-4-2)27aba-1.

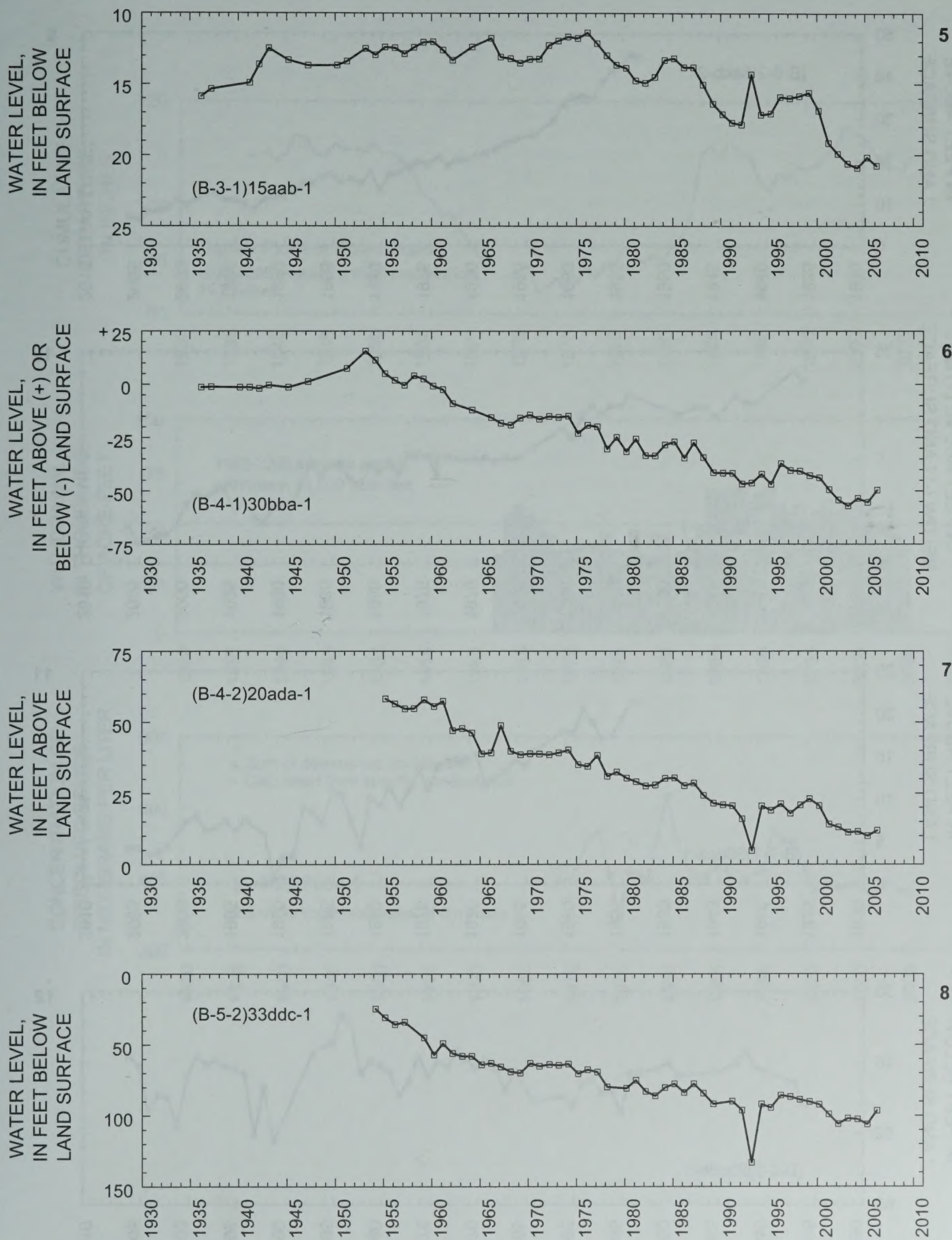


Figure 7. Relation of water level in selected wells in the East Shore area to cumulative departure from average annual precipitation at Ogden Pioneer Powerhouse, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (B-4-2)27aba-1—Continued.

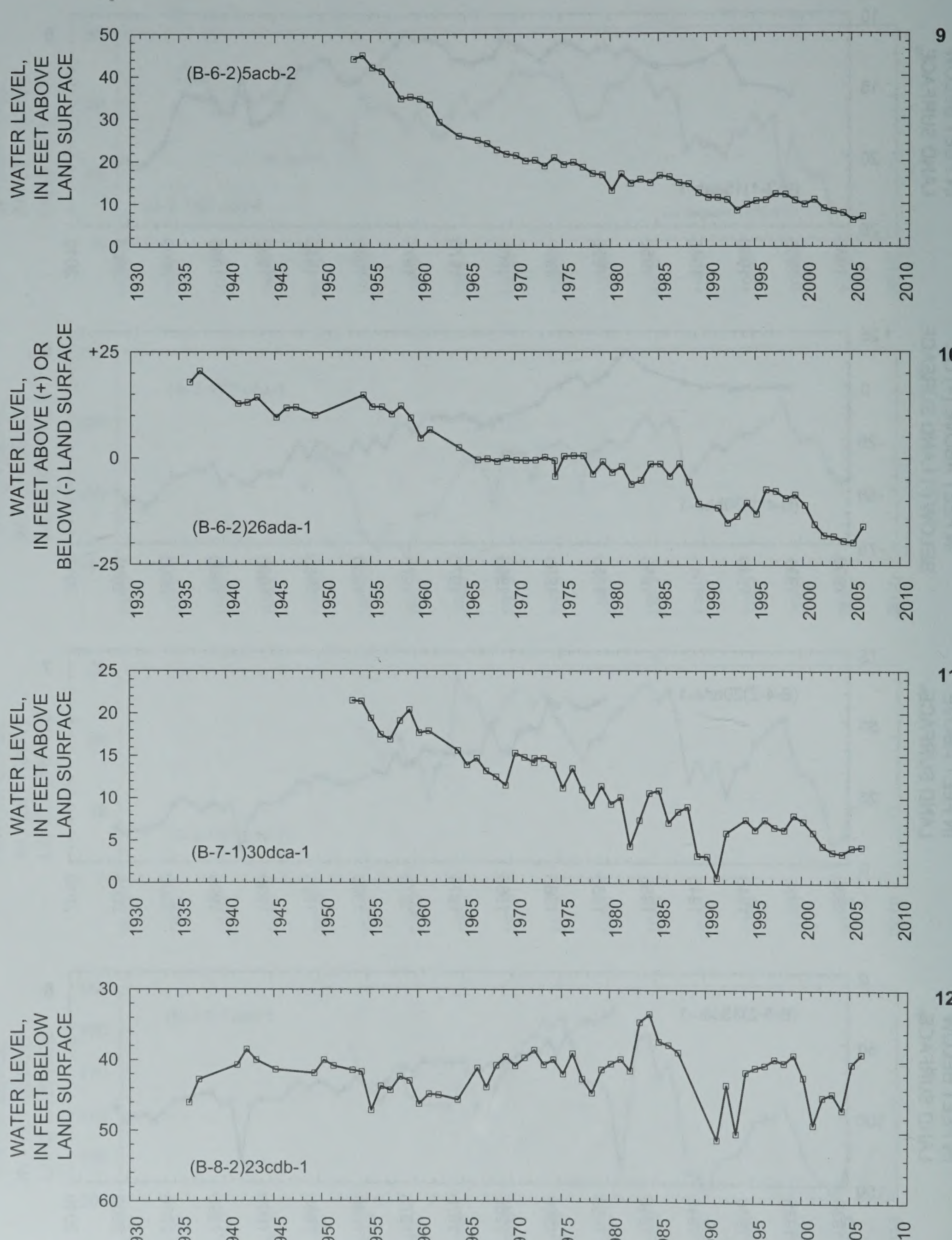


Figure 7. Relation of water level in selected wells in the East Shore area to cumulative departure from average annual precipitation at Ogden Pioneer Powerhouse, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (B-4-2)27aba-1—Continued.

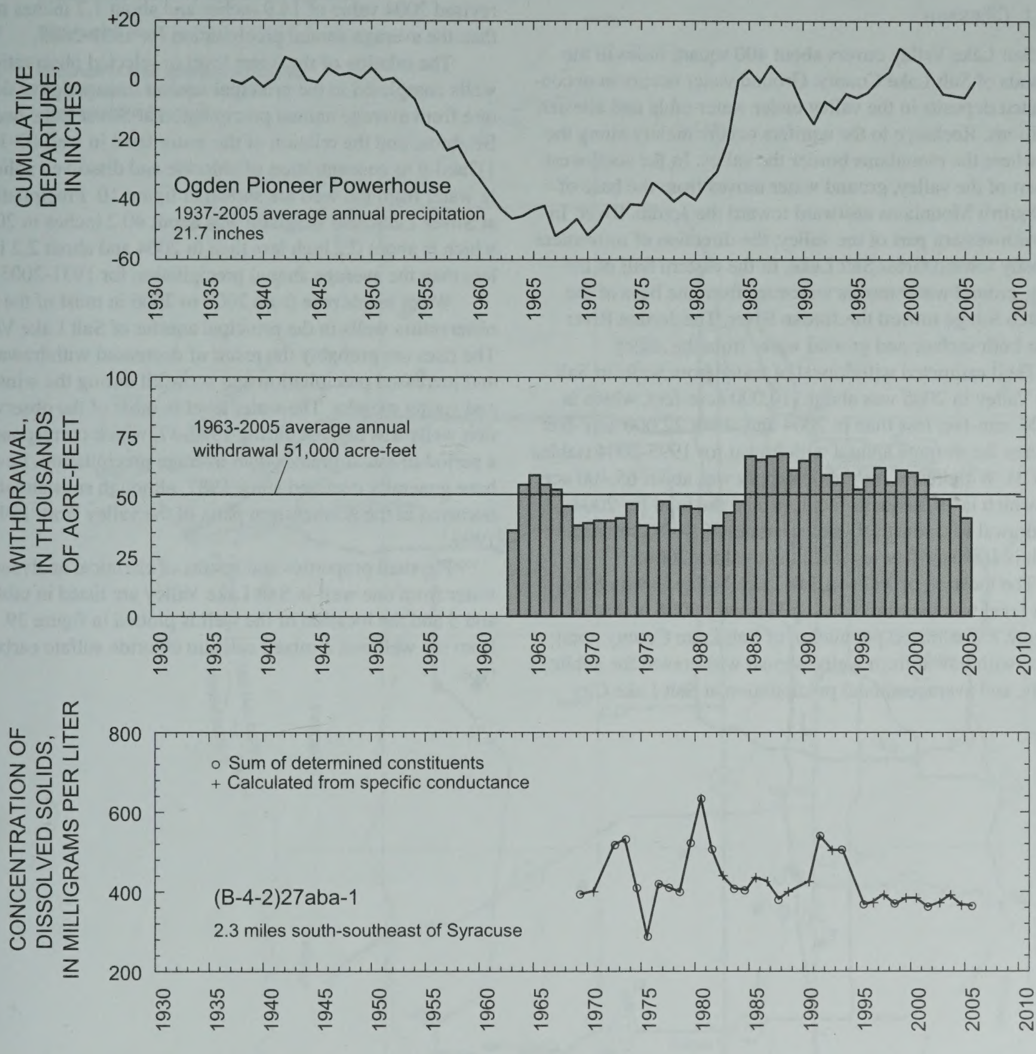


Figure 7. Relation of water level in selected wells in the East Shore area to cumulative departure from average annual precipitation at Ogden Pioneer Powerhouse, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (B-4-2)27aba-1—Continued.

SALT LAKE VALLEY

By J.L. Cillessen

Salt Lake Valley covers about 400 square miles in the lowlands of Salt Lake County. Ground water occurs in unconsolidated deposits in the valley under water-table and artesian conditions. Recharge to the aquifers occurs mainly along the area where the mountains border the valley. In the southwestern part of the valley, ground water moves from the base of the Oquirrh Mountains eastward toward the Jordan River. In the northwestern part of the valley, the direction of movement is mostly toward Great Salt Lake. In the eastern half of the valley, ground water moves westward from the base of the Wasatch Range toward the Jordan River. The Jordan River drains both surface and ground water from the valley.

Total estimated withdrawal of water from wells in Salt Lake Valley in 2005 was about 110,000 acre-feet, which is 15,000 acre-feet less than in 2004 and about 22,000 acre-feet less than the average annual withdrawal for 1995-2004 (tables 2 and 3). Withdrawal for public supply was about 65,400 acre-feet, which is 10,500 acre-feet less than the total for 2004. Withdrawal for industrial use was about 20,400 acre-feet, which is 100 acre-feet less than the total for 2004.

The location of wells in Salt Lake Valley in which the water level was measured during February 2006 is shown in figure 8. Estimated population of Salt Lake County, total annual withdrawal from wells, annual withdrawal for public supply, and average annual precipitation at Salt Lake City Weather Service Office (WSO) (International Airport) are shown in figure 9. Precipitation at Salt Lake City WSO during 2005 was about 16.9 inches, about 2.0 inches more than the revised 2004 value of 14.9 inches and about 1.7 inches more than the average annual precipitation for 1931-2005.

The relation of the water level in selected observation wells completed in the principal aquifer to cumulative departure from average annual precipitation at Silver Lake near Brighton, and the relation of the water level in well (D-1-1)7abd-6 to concentration of chloride and dissolved solids in water from the well are shown in figure 10. Precipitation at Silver Lake near Brighton was about 40.2 inches in 2005, which is about 0.2 inch less than in 2004 and about 2.2 inches less than the average annual precipitation for 1931-2005.

Water levels rose from 2005 to 2006 in most of the observation wells in the principal aquifer of Salt Lake Valley. The rises are probably the result of decreased withdrawals and increased precipitation and snowfall during the winter and spring months. The water level in most of the observation wells was highest during 1985-87, which corresponds to a period of much-greater-than-average precipitation. Levels have generally declined since 1987, although substantial rises occurred in the northeastern parts of the valley from 1994 to 1999.

Physical properties and results of chemical analyses for water from one well in Salt Lake Valley are listed in tables 4 and 5 and the location of the well is plotted in figure 39. Water from the well was a mixed calcium chloride sulfate carbonate type.

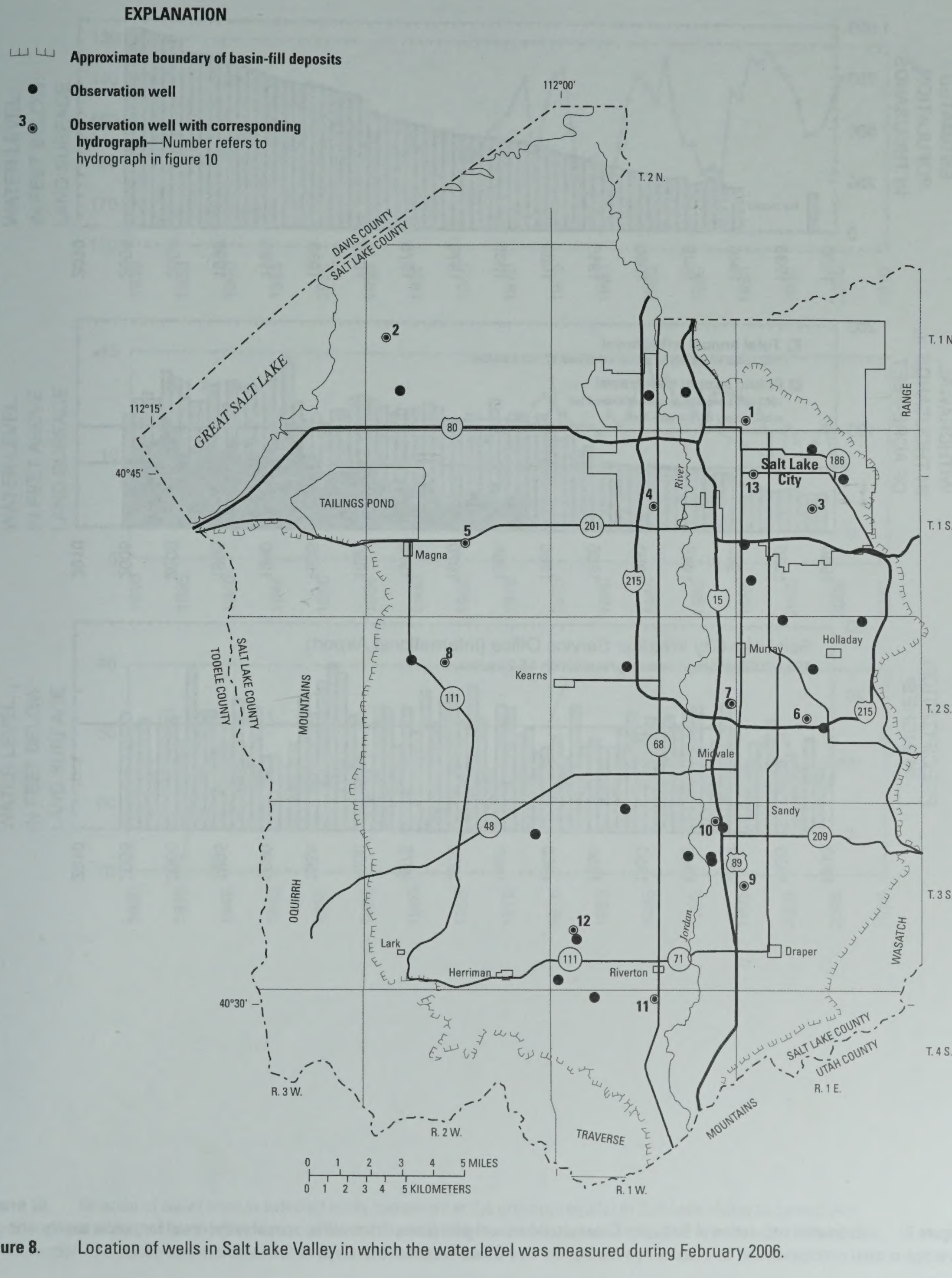


Figure 8. Location of wells in Salt Lake Valley in which the water level was measured during February 2006.

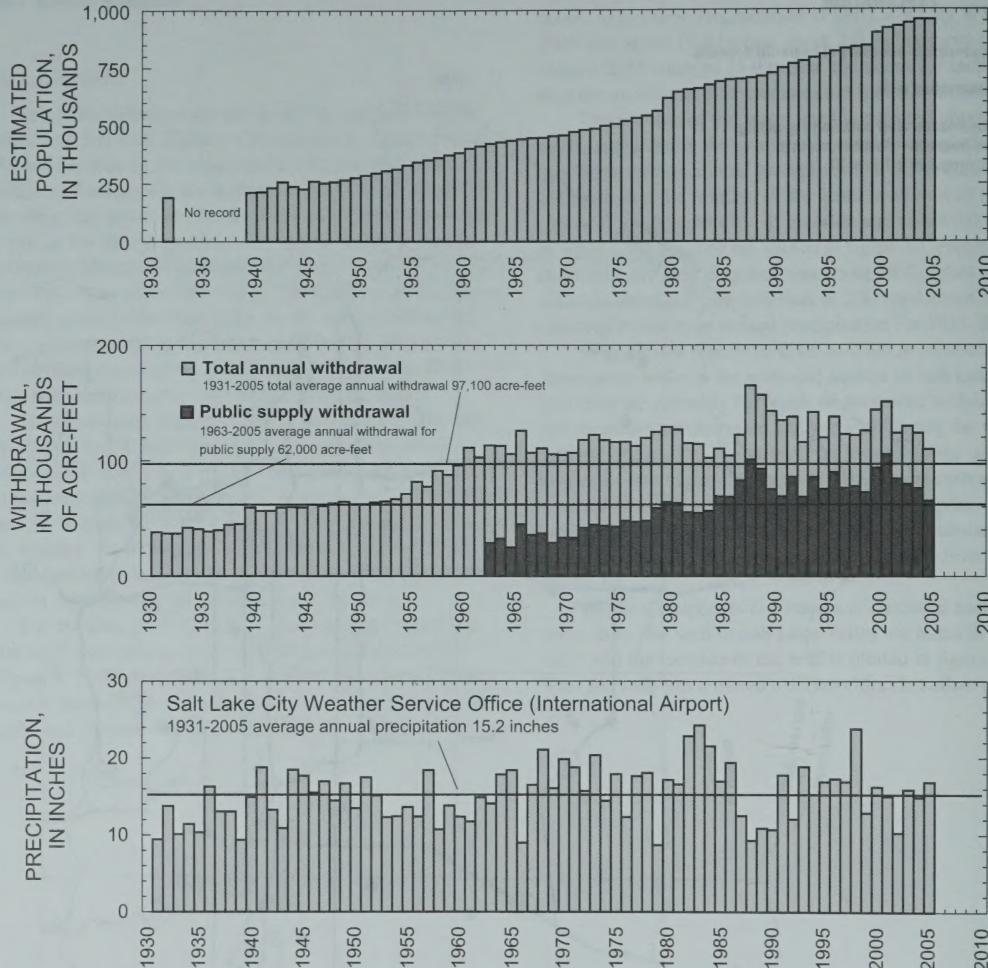


Figure 9. Estimated population of Salt Lake County, total annual withdrawal from wells, annual withdrawal for public supply, and average annual precipitation at Salt Lake City Weather Service Office (International Airport).

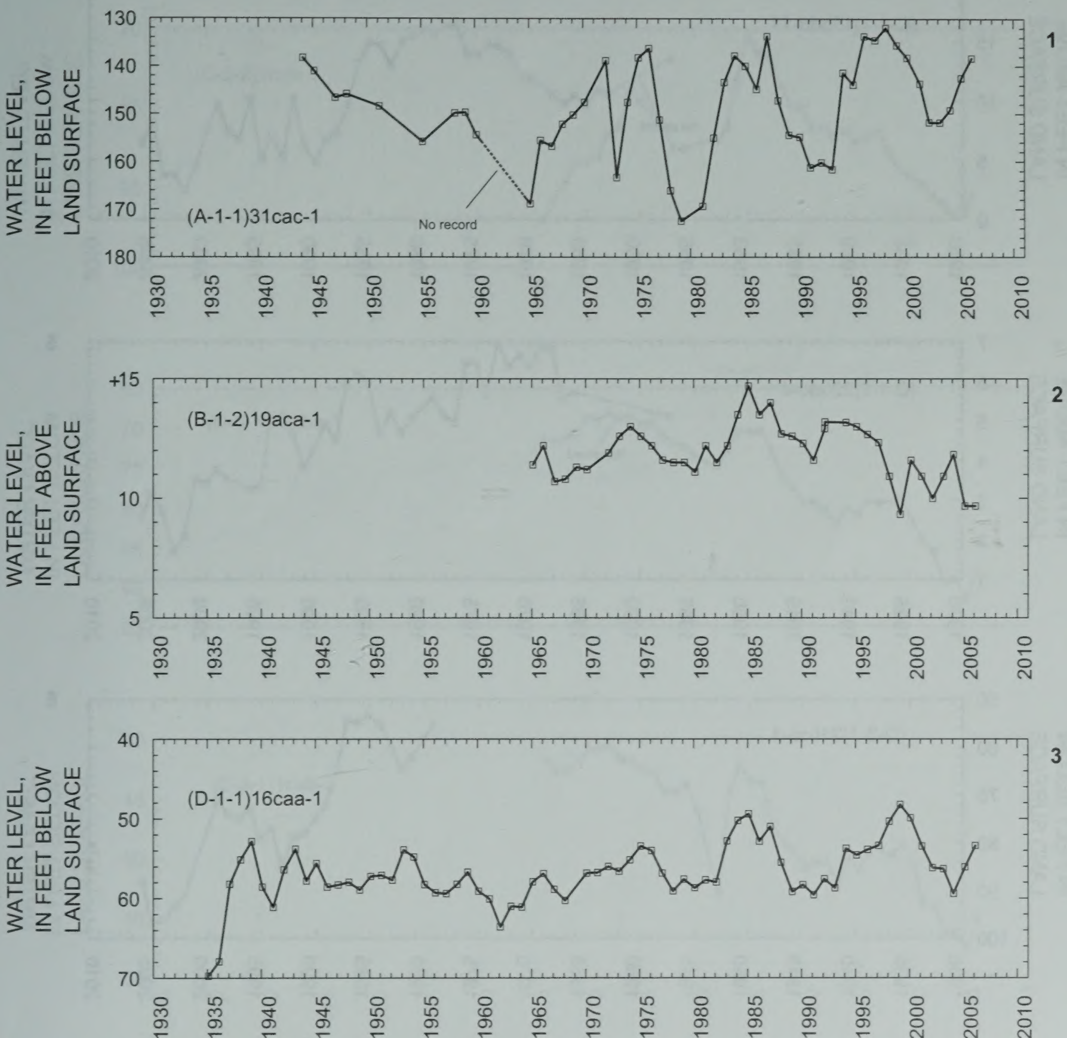


Figure 10. Relation of water level in selected wells completed in the principal aquifer in Salt Lake Valley to cumulative departure from average annual precipitation at Silver Lake near Brighton, and relation of water level in well (D-1-1)7abd-6 to concentration of chloride and dissolved solids in water from the well.

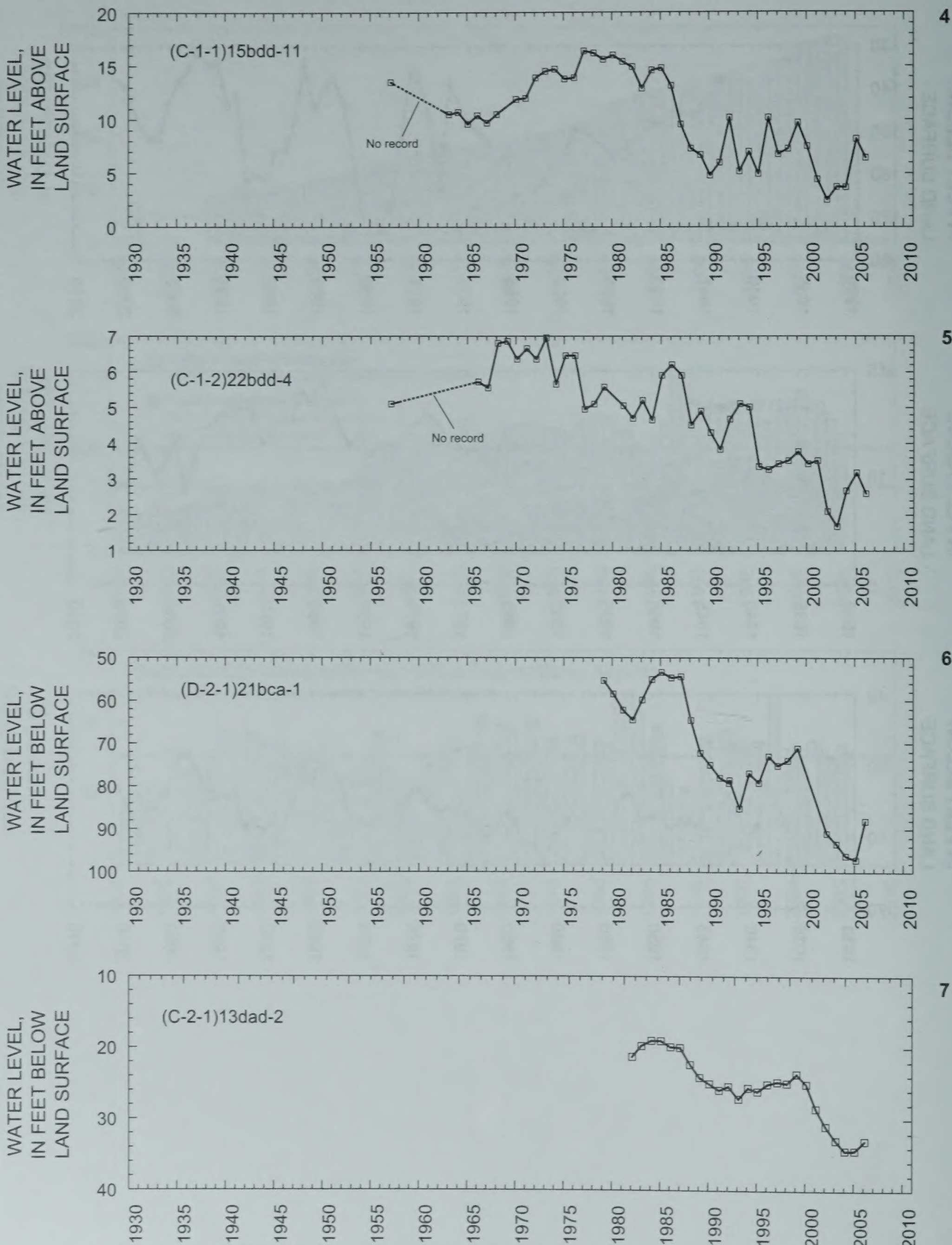


Figure 10. Relation of water level in selected wells completed in the principal aquifer in Salt Lake Valley to cumulative departure from average annual precipitation at Silver Lake near Brighton, and relation of water level in well (D-1-1)7abd-6 to concentration of chloride and dissolved solids in water from the well—Continued.

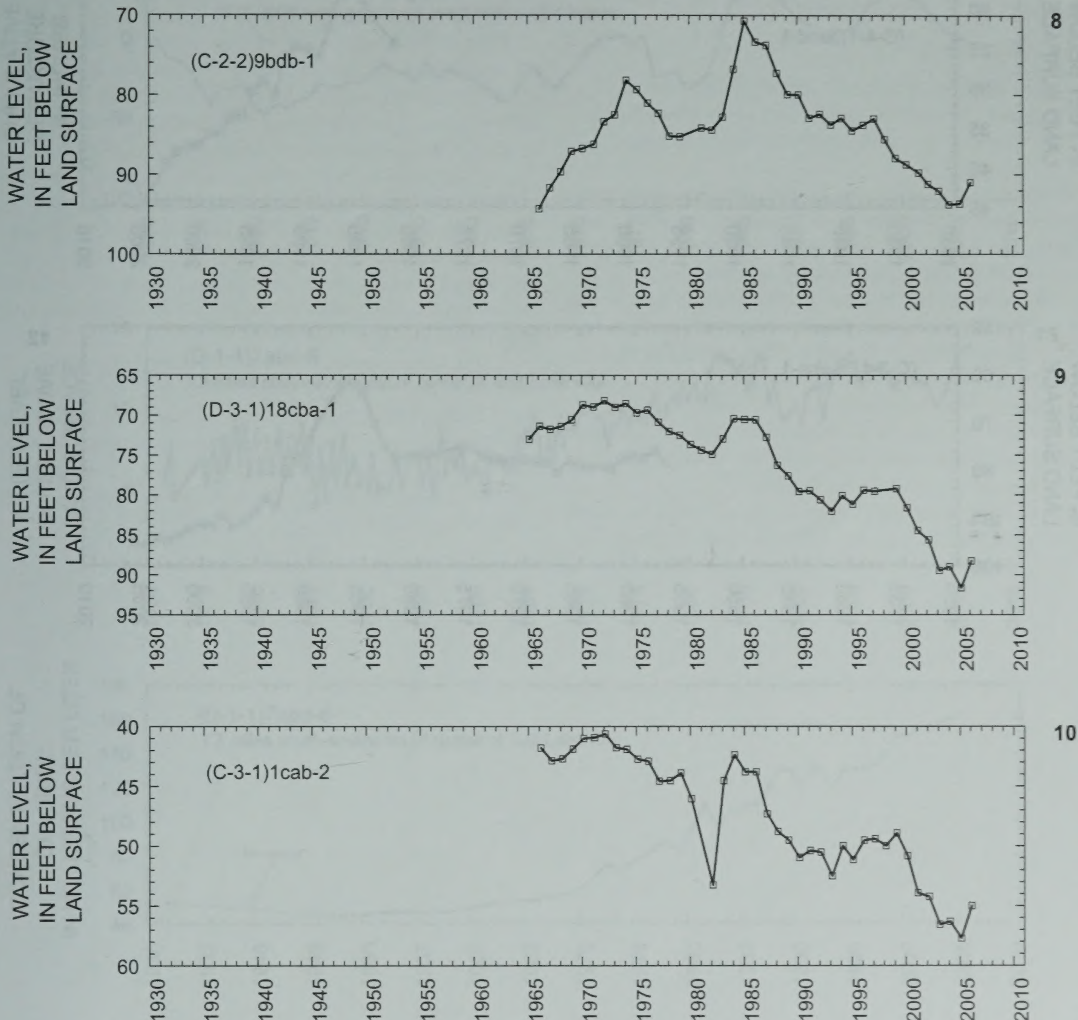


Figure 10. Relation of water level in selected wells completed in the principal aquifer in Salt Lake Valley to cumulative departure from average annual precipitation at Silver Lake near Brighton, and relation of water level in well (D-1-1)7abd-6 to concentration of chloride and dissolved solids in water from the well—Continued.

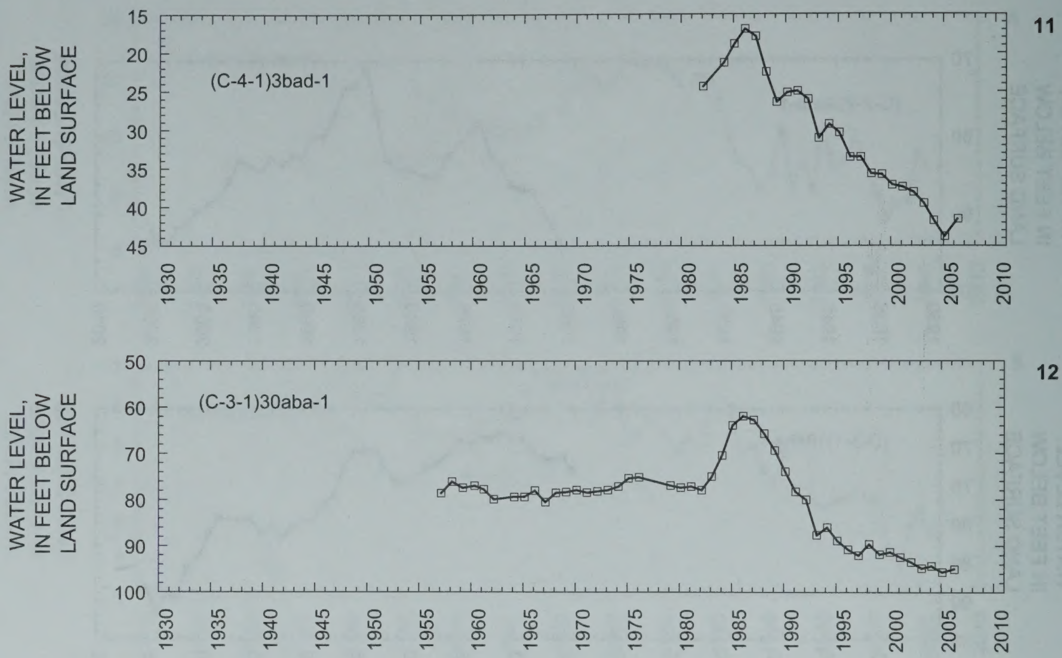


Figure 10. Relation of water level in selected wells completed in the principal aquifer in Salt Lake Valley to cumulative departure from average annual precipitation at Silver Lake near Brighton, and relation of water level in well (D-1-1)7abd-6 to concentration of chloride and dissolved solids in water from the well—Continued.

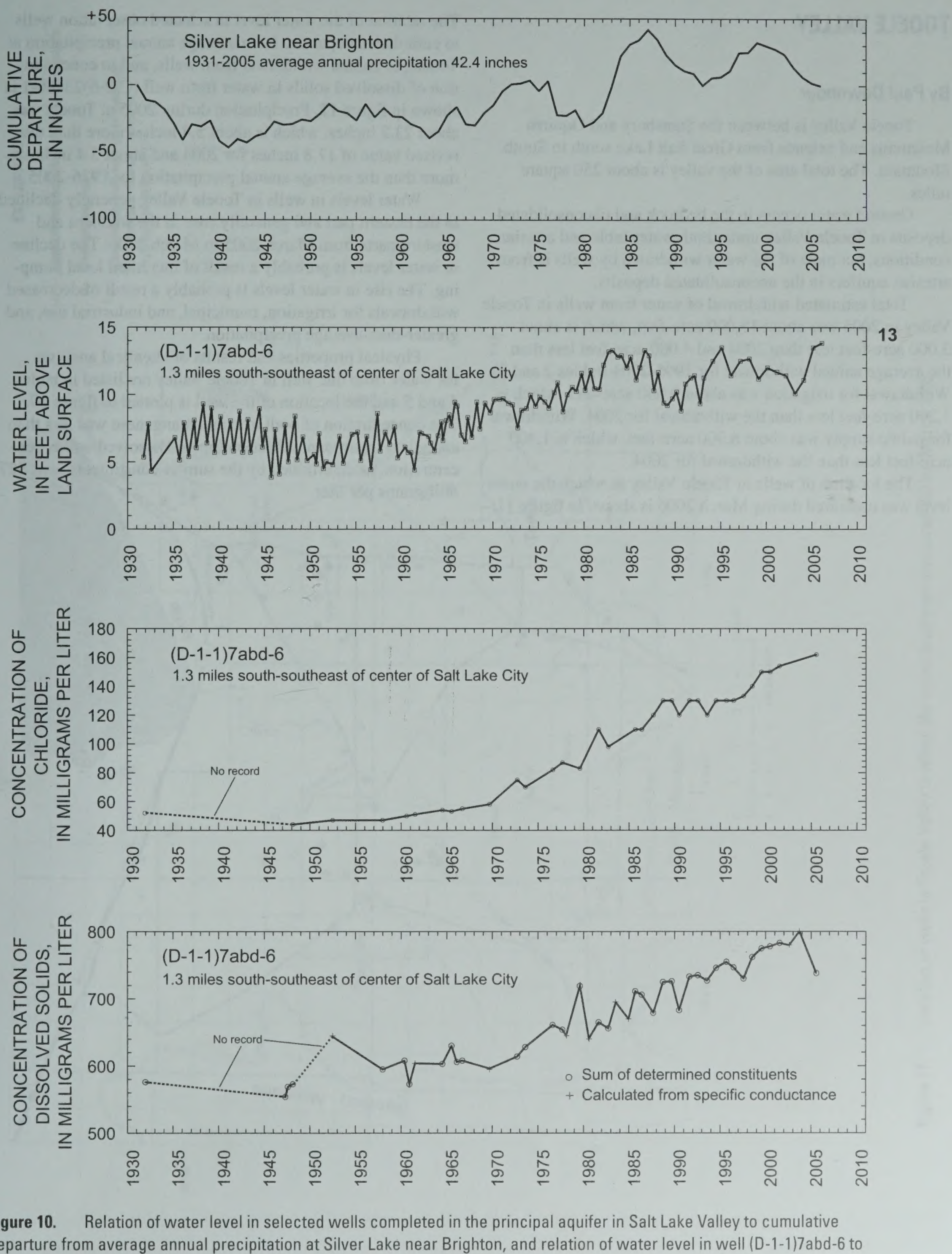


Figure 10. Relation of water level in selected wells completed in the principal aquifer in Salt Lake Valley to cumulative departure from average annual precipitation at Silver Lake near Brighton, and relation of water level in well (D-1-1)7abd-6 to concentration of chloride and dissolved solids in water from the well—Continued.

TOOELE VALLEY

By Paul Downhour

Tooele Valley is between the Stansbury and Oquirrh Mountains and extends from Great Salt Lake south to South Mountain. The total area of the valley is about 250 square miles.

Ground water occurs in the bedrock and unconsolidated deposits in Tooele Valley under both water-table and artesian conditions, but most of the water withdrawn by wells is from artesian aquifers in the unconsolidated deposits.

Total estimated withdrawal of water from wells in Tooele Valley in 2005 was about 18,000 acre-feet, which is about 3,000 acre-feet less than 2004 and 4,000 acre-feet less than the average annual withdrawal for 1995-2004 (tables 2 and 3). Withdrawal for irrigation was about 9,000 acre-feet, which is 1,200 acre-feet less than the withdrawal for 2004. Withdrawal for public supply was about 6,900 acre-feet, which is 1,400 acre-feet less than the withdrawal for 2004.

The location of wells in Tooele Valley in which the water level was measured during March 2006 is shown in figure 11. The relation of the water level in selected observation wells to cumulative departure from average annual precipitation at Tooele, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-2-6)23cbb-1 is shown in figure 12. Precipitation during 2005 at Tooele was about 23.2 inches, which is about 5.4 inches more than the revised value of 17.8 inches for 2004 and about 5.4 inches more than the average annual precipitation for 1936-2005.

Water levels in wells in Tooele Valley generally declined in the eastern part and generally rose in the southern and western parts from March 2005 to March 2006. The decline in water levels is probably a result of increased local pumping. The rise in water levels is probably a result of decreased withdrawals for irrigation, municipal, and industrial use, and greater-than-average precipitation.

Physical properties and results of chemical analyses for water from one well in Tooele Valley are listed in tables 4 and 5 and the location of the well is plotted in figure 39. The concentration of both iron and manganese was less than analytical instrument detection limits. Dissolved-solids concentration, as determined by the sum of constituents, was 627 milligrams per liter.

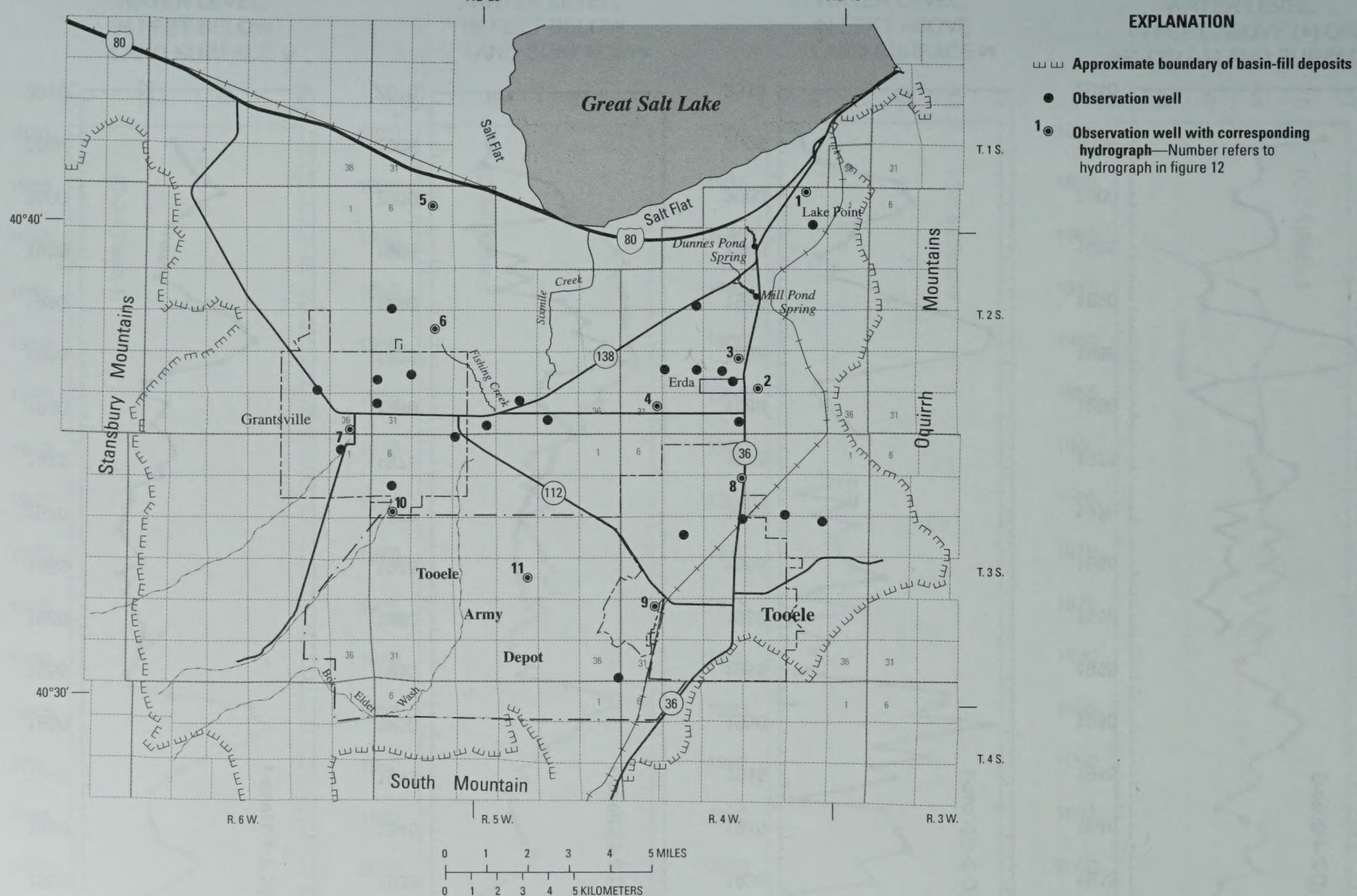


Figure 11. Location of wells in Tooele Valley in which the water level was measured during March 2006.

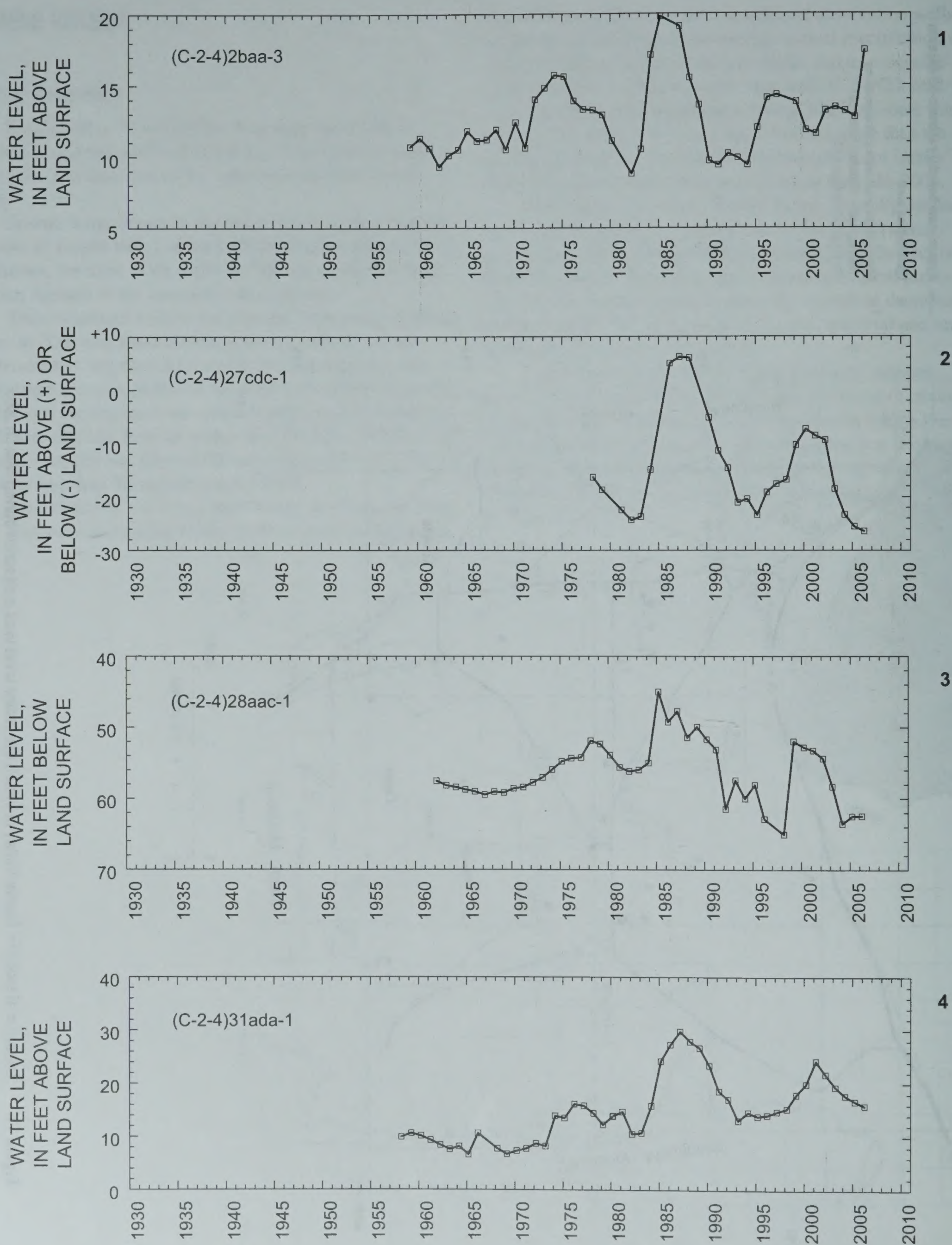


Figure 12. Relation of water level in selected wells in Tooele Valley to cumulative departure from average annual precipitation at Tooele, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-2-6)23cbb-1.

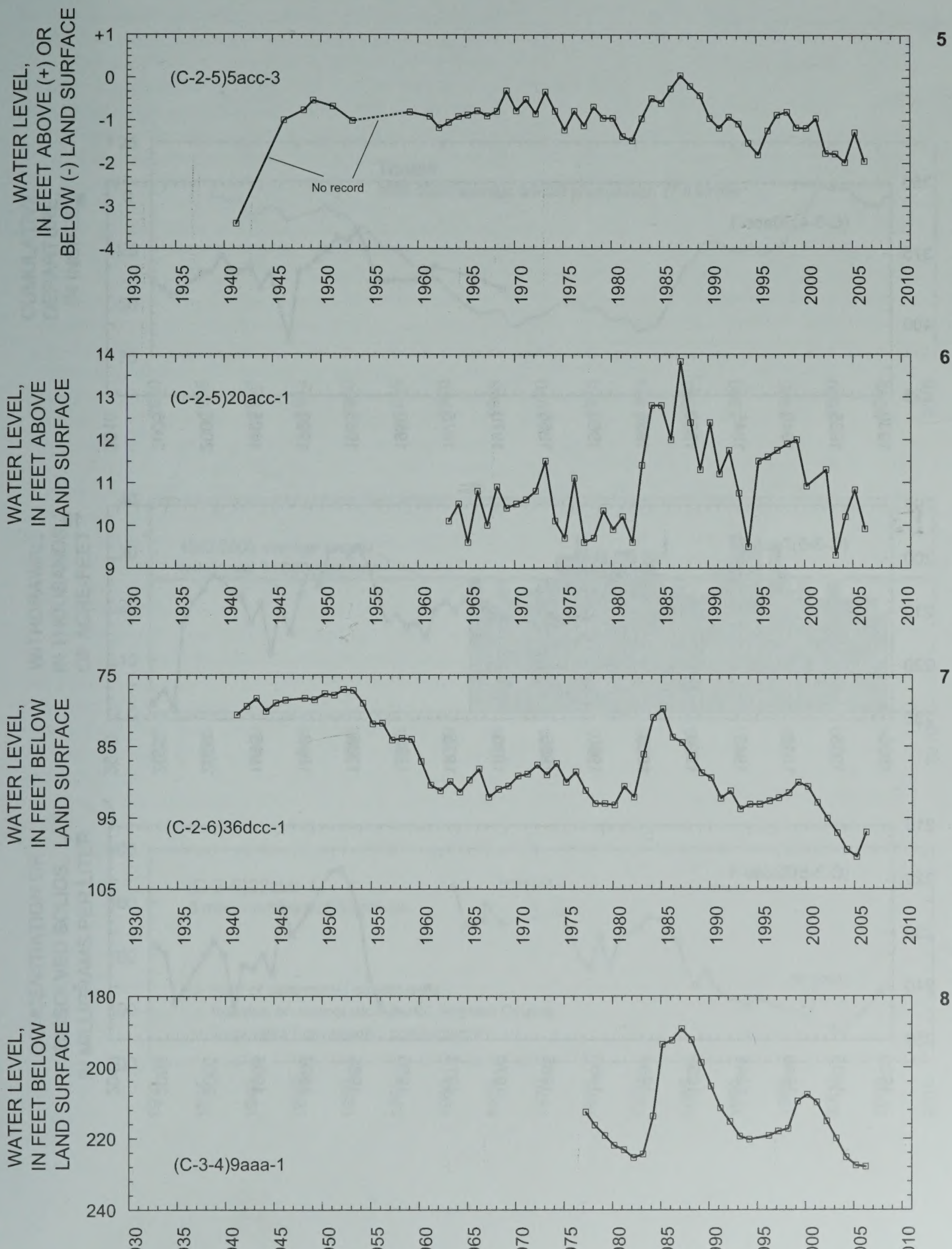


Figure 12. Relation of water level in selected wells in Tooele Valley to cumulative departure from average annual precipitation at Tooele, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-2-6)23cbb-1—Continued.

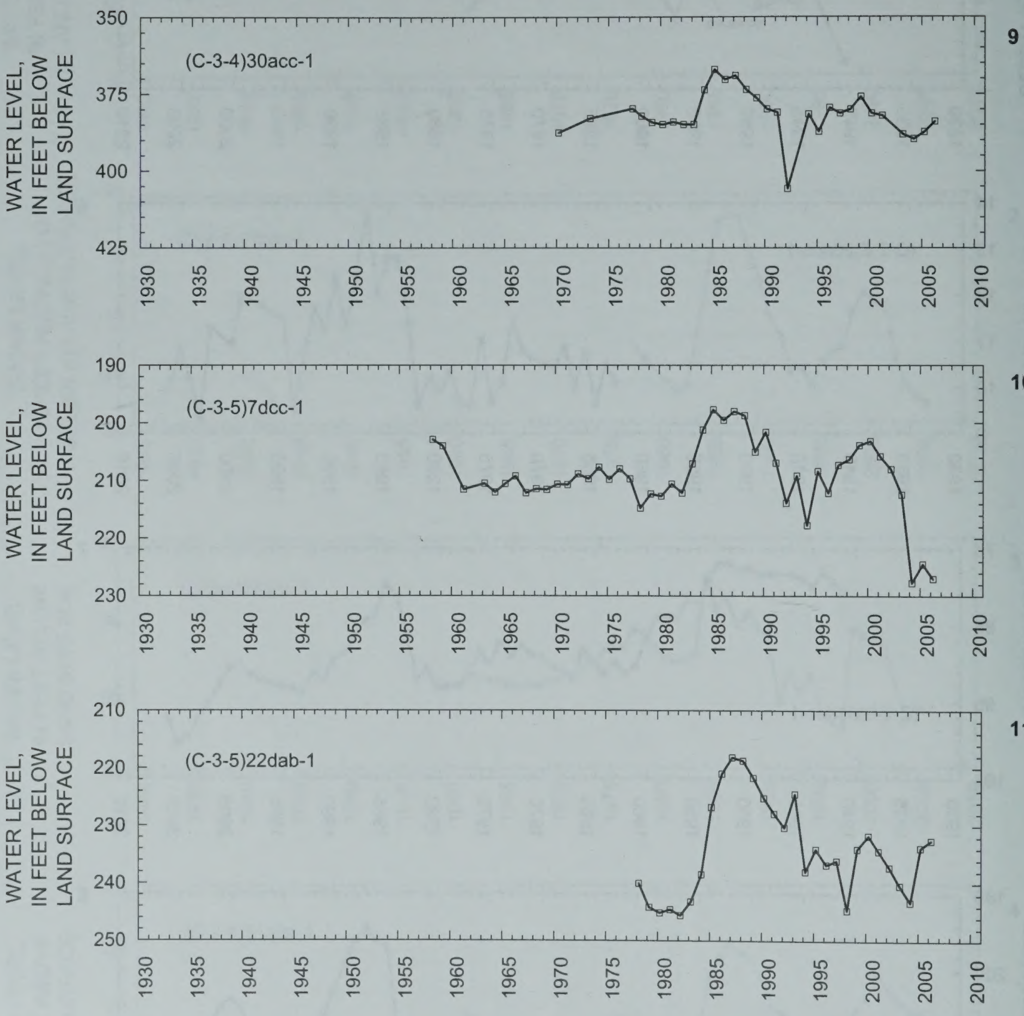


Figure 12. Relation of water level in selected wells in Tooele Valley to cumulative departure from average annual precipitation at Tooele, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-2-6)23cbb-1—Continued.

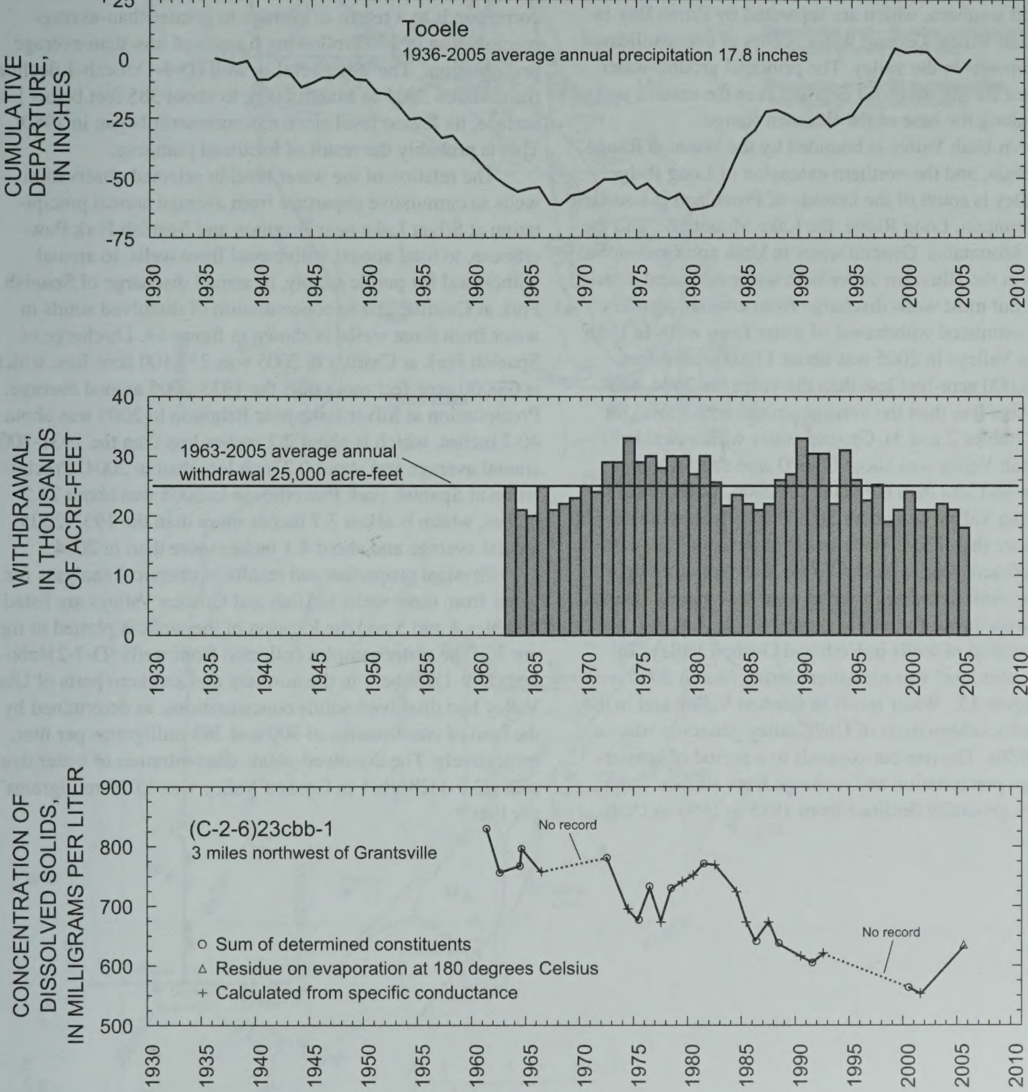


Figure 12. Relation of water level in selected wells in Tooele Valley to cumulative departure from average annual precipitation at Tooele, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-2-6)23cbb-1—Continued.

UTAH AND GOSHEN VALLEYS

By C.D. Wilkowske

Utah Valley is divided into two ground-water basins, northern and southern, which are separated by Provo Bay in northern Utah Valley. Ground water occurs in unconsolidated basin-fill deposits in the valley. The principal ground-water recharge area for the basin-fill deposits is in the eastern part of the valley, along the base of the Wasatch Range.

Southern Utah Valley is bounded by the Wasatch Range, West Mountain, and the northern extension of Long Ridge. Goshen Valley is south of the latitude of Provo and is bounded by West Mountain, Long Ridge, the Lake Mountains, and the East Tintic Mountains. Ground water in Utah and Goshen Valleys occurs in the alluvium under both water-table and artesian conditions, but most wells discharge from artesian aquifers.

Total estimated withdrawal of water from wells in Utah and Goshen Valleys in 2005 was about 110,000 acre-feet, which is 18,000 acre-feet less than the value for 2004, and 2,000 acre-feet less than the average annual withdrawal for 1995-2004 (tables 2 and 3). Ground-water withdrawal in northern Utah Valley was about 68,600 acre-feet, which is 20,000 acre-feet less than the value for 2004. Withdrawal in southern Utah Valley was about 30,800 acre-feet, which is 600 acre-feet more than 2004. Withdrawal in Goshen Valley was about 10,700 acre-feet, which is 1,600 acre-feet more than 2004. The overall decrease in withdrawal was mainly due to decreased withdrawal for public supply.

The location of wells in Utah and Goshen Valleys in which the water level was measured during March 2006 is shown in figure 13. Water levels in Goshen Valley and in the northern and southern parts of Utah Valley generally rose in the early 1980s. The rise corresponds to a period of greater-than-average precipitation and recharge from surface water. Water levels generally declined from 1985 to 1993 in Utah Valley and generally rose from 1993 to 1998. This rise is the result of greater-than-average precipitation during this period. Water levels generally declined throughout Utah Valley from March 1999 to March 2005. Water levels in some wells reached their lowest level for their period of record, many dating back to 1935. From March 2005 to March 2006, most water levels in Utah and Goshen Valleys rose. This trend corresponds to a return to average to greater-than-average precipitation in 2005 following 6 years of less-than-average precipitation. The water level in well (D-4-1)36cab-1 declined from March 2005 to March 2006, to about 385 feet below land surface, its lowest level since measurements began in 1980. This is probably the result of localized pumping.

The relation of the water level in selected observation wells to cumulative departure from average annual precipitation at Silver Lake near Brighton and Spanish Fork Powerhouse, to total annual withdrawal from wells, to annual withdrawal for public supply, to annual discharge of Spanish Fork at Castilla, and to concentration of dissolved solids in water from three wells, is shown in figure 14. Discharge of Spanish Fork at Castilla in 2005 was 233,100 acre-feet, which is 65,000 acre-feet more than the 1933-2005 annual average. Precipitation at Silver Lake near Brighton in 2005 was about 40.2 inches, which is about 2.2 inches less than the 1931-2005 annual average and about 0.2 inch less than in 2004. Precipitation at Spanish Fork Powerhouse in 2005 was about 23.2 inches, which is about 3.7 inches more than the 1937-2005 annual average and about 4.1 inches more than in 2004.

Physical properties and results of chemical analyses for water from three wells in Utah and Goshen Valleys are listed in tables 4 and 5 and the location of the wells is plotted in figure 39. The water samples collected from wells (D-7-2)4cbb-2 and (D-9-1)36bbc-1 in the northern and southern parts of Utah Valley had dissolved-solids concentrations, as determined by the sum of constituents, of 309 and 263 milligrams per liter, respectively. The dissolved-solids concentration of water from well (C-9-1)28ccb-1 in Goshen Valley was 1,020 milligrams per liter.

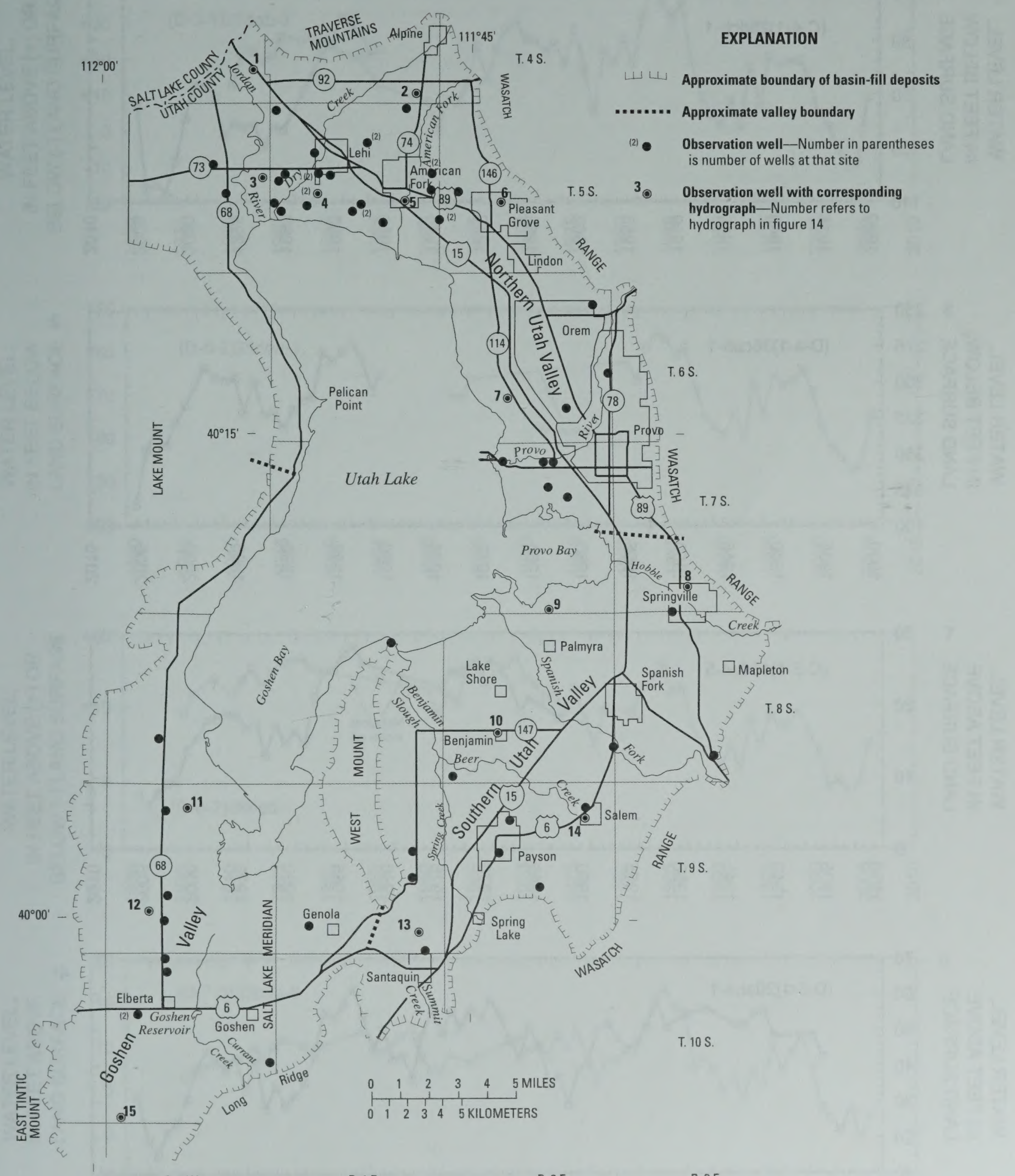


Figure 13. Location of wells in Utah and Goshen Valleys in which the water level was measured during March 2006

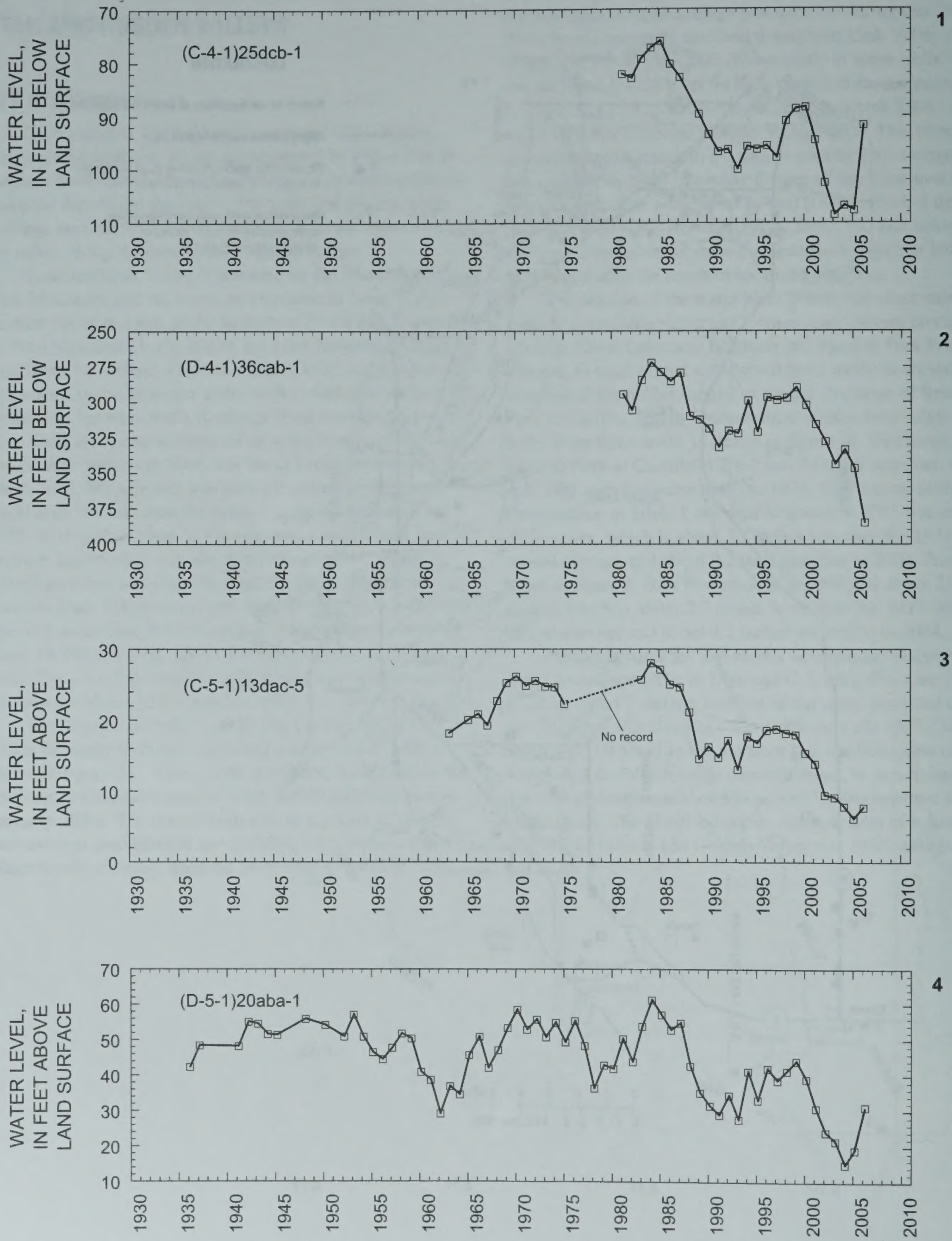


Figure 14. Relation of water level in selected wells in Utah and Goshen Valleys to cumulative departure from average annual precipitation at Silver Lake near Brighton and Spanish Fork Powerhouse, to total annual withdrawal from wells, to annual withdrawal for public supply, to annual discharge of Spanish Fork at Castilla, and to concentration of dissolved solids in water from three wells.

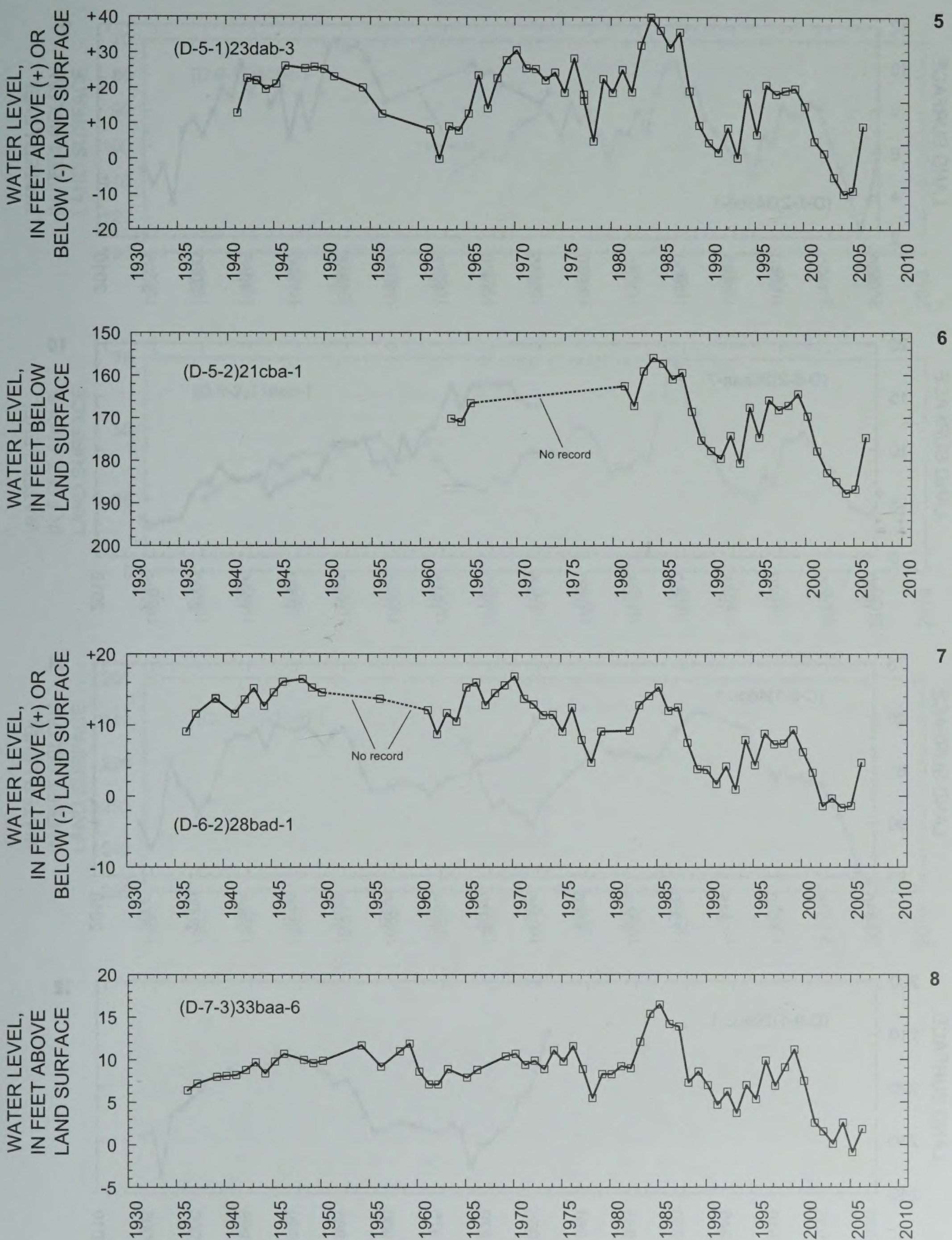


Figure 14. Relation of water level in selected wells in Utah and Goshen Valleys to cumulative departure from average annual precipitation at Silver Lake near Brighton and Spanish Fork Powerhouse, to total annual withdrawal from wells, to annual withdrawal for public supply, to annual discharge of Spanish Fork at Castilla, and to concentration of dissolved solids in water from three wells—Continued.

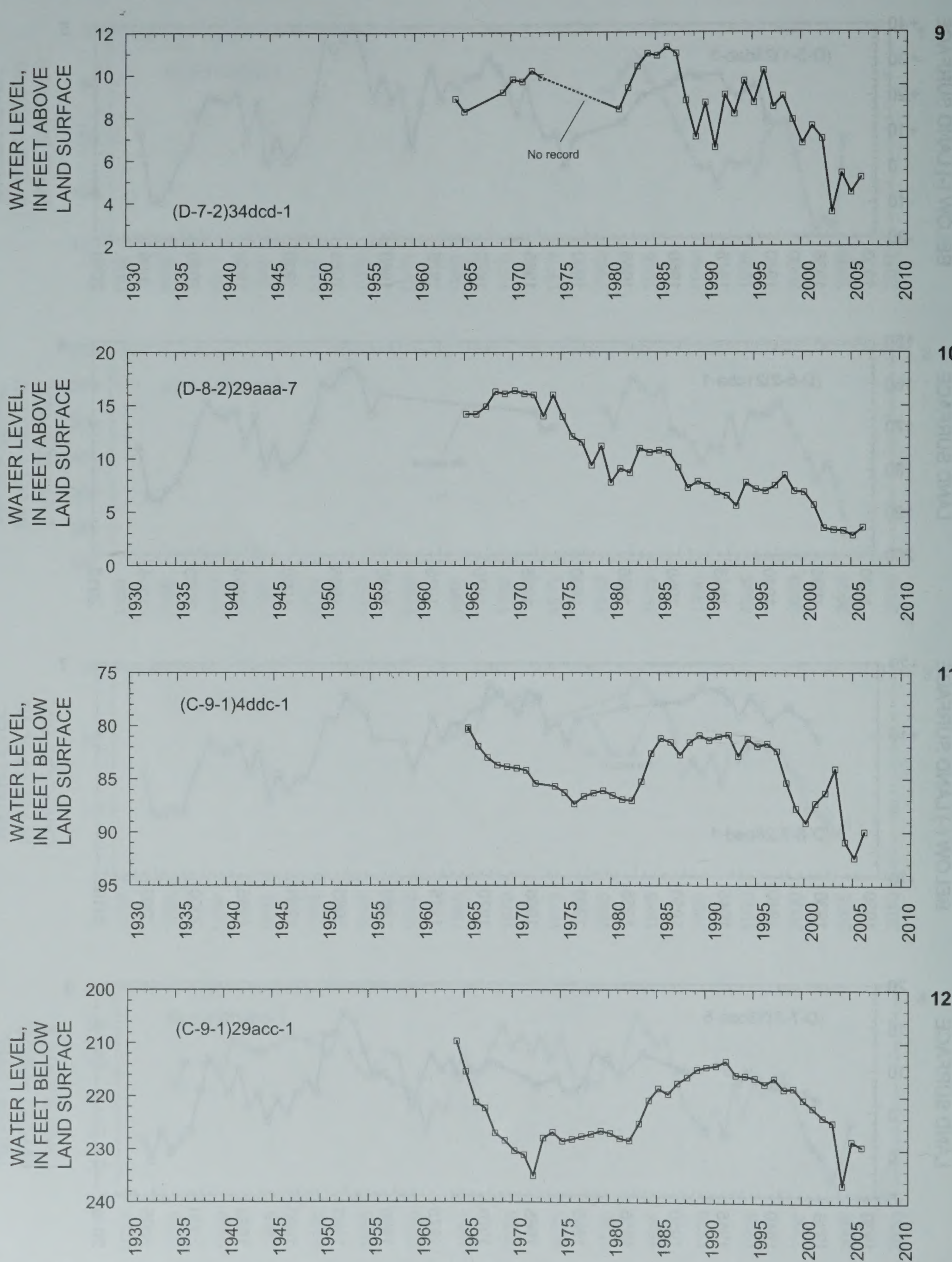


Figure 14. Relation of water level in selected wells in Utah and Goshen Valleys to cumulative departure from average annual precipitation at Silver Lake near Brighton and Spanish Fork Powerhouse, to total annual withdrawal from wells, to annual withdrawal for public supply, to annual discharge of Spanish Fork at Castilla, and to concentration of dissolved solids in water from three wells—Continued.

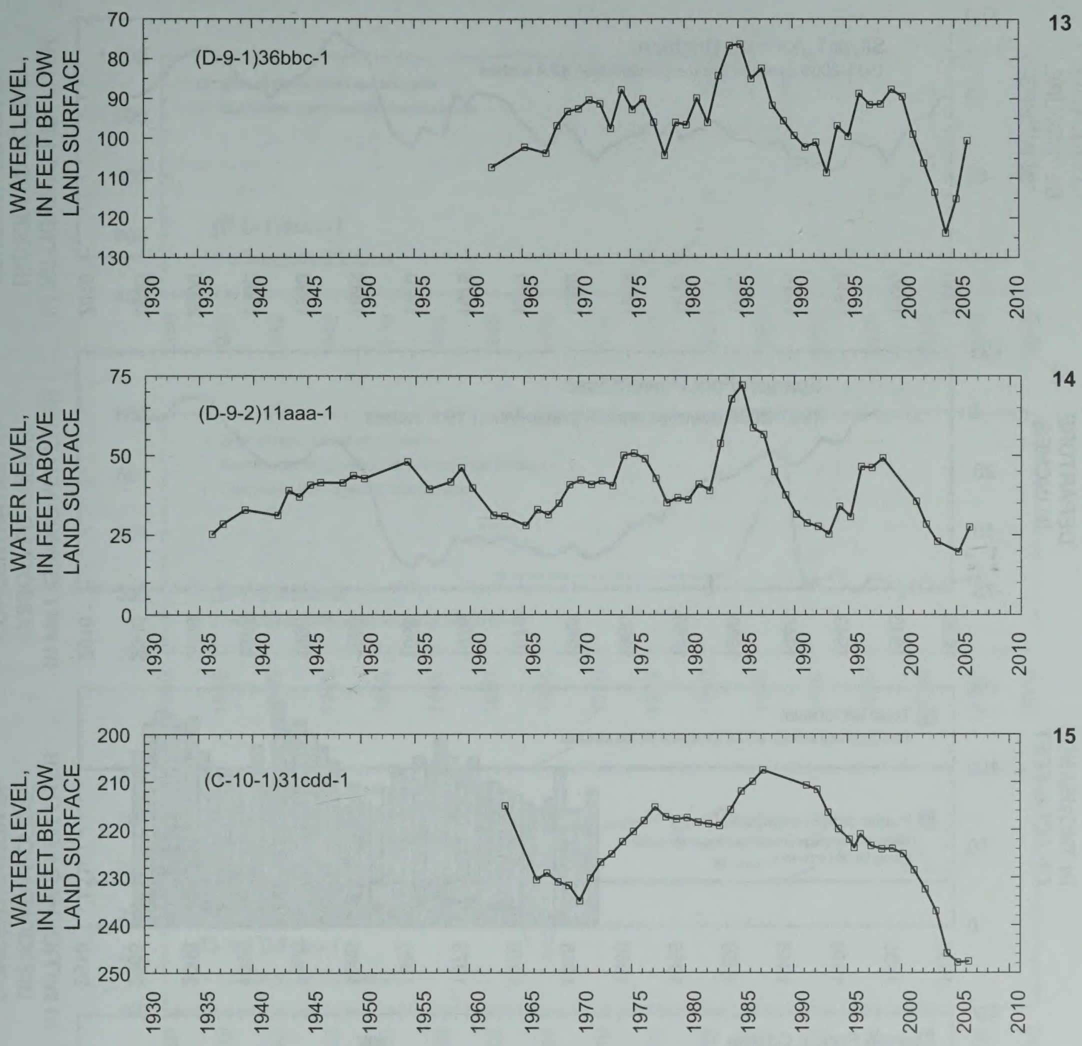


Figure 14. Relation of water level in selected wells in Utah and Goshen Valleys to cumulative departure from average annual precipitation at Silver Lake near Brighton and Spanish Fork Powerhouse, to total annual withdrawal from wells, to annual withdrawal for public supply, to annual discharge of Spanish Fork at Castilla, and to concentration of dissolved solids in water from three wells—Continued.

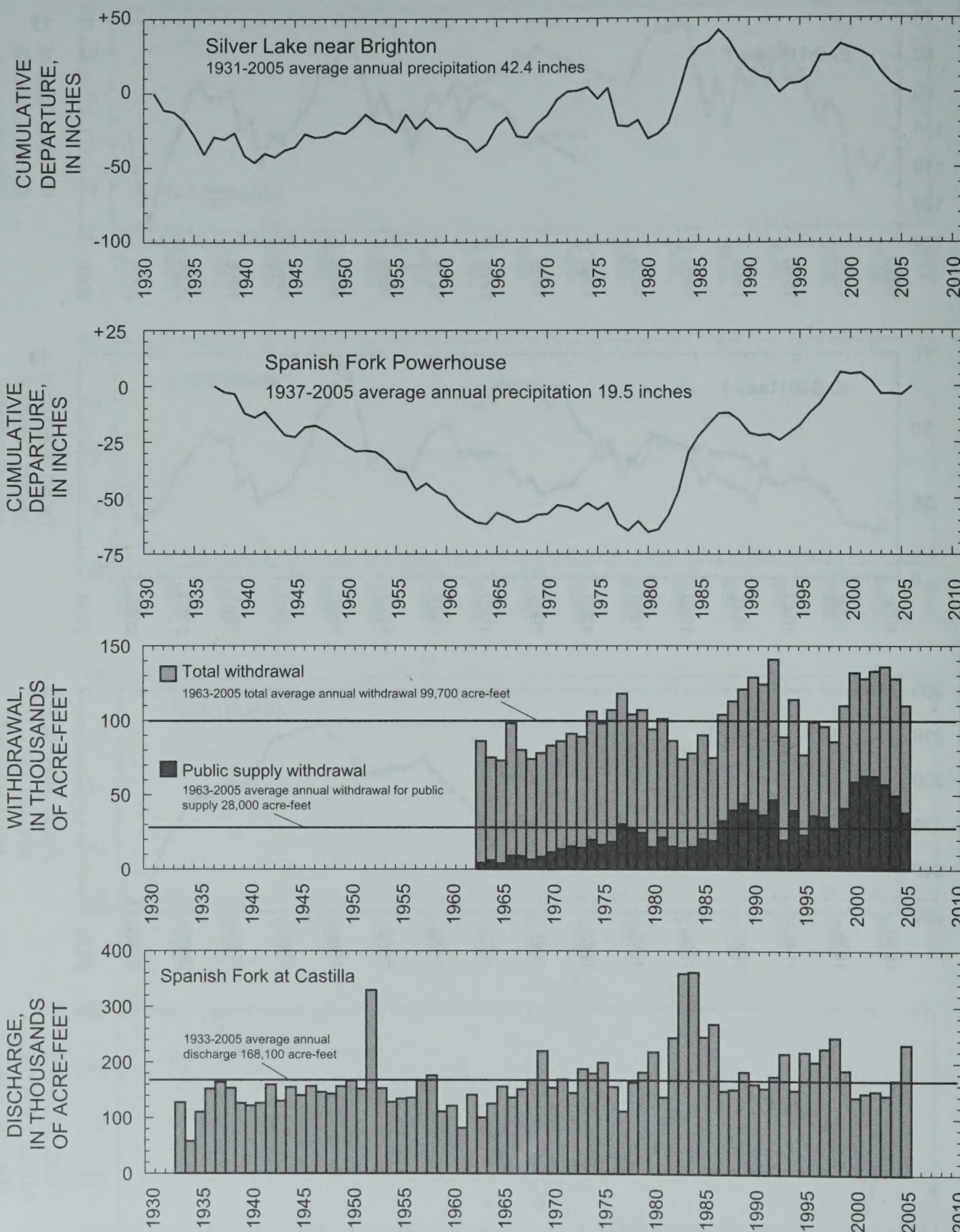


Figure 14. Relation of water level in selected wells in Utah and Goshen Valleys to cumulative departure from average annual precipitation at Silver Lake near Brighton and Spanish Fork Powerhouse, to total annual withdrawal from wells, to annual withdrawal for public supply, to annual discharge of Spanish Fork at Castilla, and to concentration of dissolved solids in water from three wells—Continued.

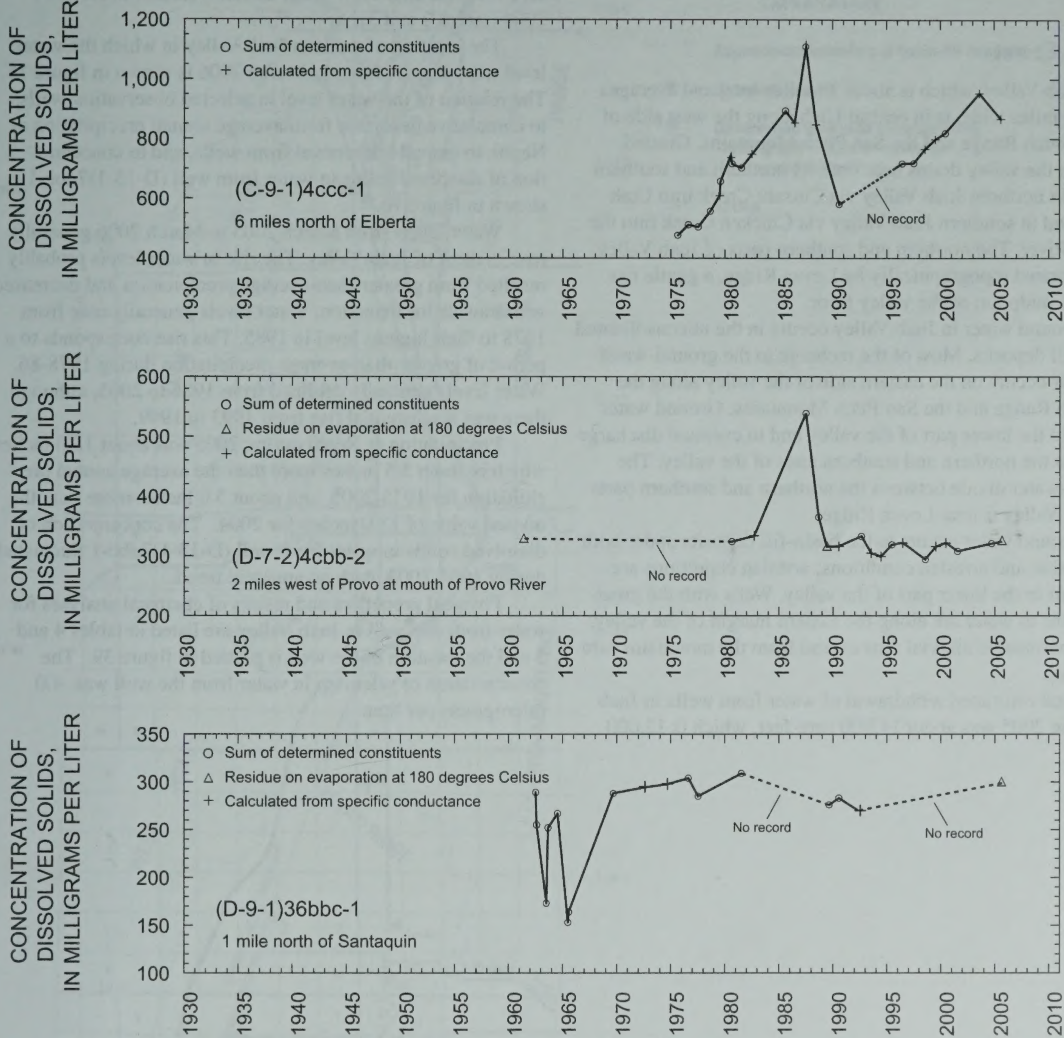


Figure 14. Relation of water level in selected wells in Utah and Goshen Valleys to cumulative departure from average annual precipitation at Silver Lake near Brighton and Spanish Fork Powerhouse, to total annual withdrawal from wells, to annual withdrawal for public supply, to annual discharge of Spanish Fork at Castilla, and to concentration of dissolved solids in water from three wells—Continued.

JUAB VALLEY

By R.J. Eacret

Juab Valley, which is about 30 miles long and averages about 4 miles wide, is in central Utah along the west side of the Wasatch Range and the San Pitch Mountains. Ground water in the valley drains near both its northern and southern ends—in northern Juab Valley via Currant Creek into Utah Lake, and in southern Juab Valley via Chicken Creek into the Sevier River. The northern and southern parts of Juab Valley are separated topographically by Levan Ridge, a gentle rise near the midpoint of the valley floor.

Ground water in Juab Valley occurs in the unconsolidated basin-fill deposits. Most of the recharge to the ground-water reservoir occurs on the eastern side of the valley along the Wasatch Range and the San Pitch Mountains. Ground water moves to the lower part of the valley and to eventual discharge points at the northern and southern ends of the valley. The ground-water divide between the northern and southern parts of Juab Valley is near Levan Ridge.

Ground water occurs in the basin-fill deposits under both water-table and artesian conditions; artesian conditions are prevalent in the lower part of the valley. Wells with the greatest depths to water are along the eastern margin of the valley, where permeable alluvial fans extend from the mountains into the valley.

Total estimated withdrawal of water from wells in Juab Valley in 2005 was about 14,000 acre-feet, which is 12,000 acre-feet less than the amount reported for 2004 and 7,000 acre-feet less than the average annual withdrawal for 1995-2004 (tables 2 and 3).

The location of wells in Juab Valley in which the water level was measured during March 2006 is shown in figure 15. The relation of the water level in selected observation wells to cumulative departure from average annual precipitation at Nephi, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (D-13-1)7dbc-1 is shown in figure 16.

Water levels from March 2005 to March 2006 generally rose in most of Juab Valley. The rise in water levels probably resulted from greater-than-average precipitation and decreased withdrawals for irrigation. Water levels generally rose from 1978 to their highest level in 1985. This rise corresponds to a period of greater-than-average precipitation during 1978-86. Water levels generally declined from 1986 to 2005, although there was a substantial rise from 1993 to 1999.

Precipitation at Nephi during 2005 was about 18.0 inches, which is about 3.5 inches more than the average annual precipitation for 1935-2005, and about 5.0 inches more than the revised value of 13.0 inches for 2004. The concentration of dissolved solids in water from well (D-13-1)7dbc-1 fluctuated during 1964-2003, with no apparent trend.

Physical properties and results of chemical analyses for water from one well in Juab Valley are listed in tables 4 and 5 and the location of the well is plotted in figure 39. The concentration of selenium in water from the well was 4.0 micrograms per liter.

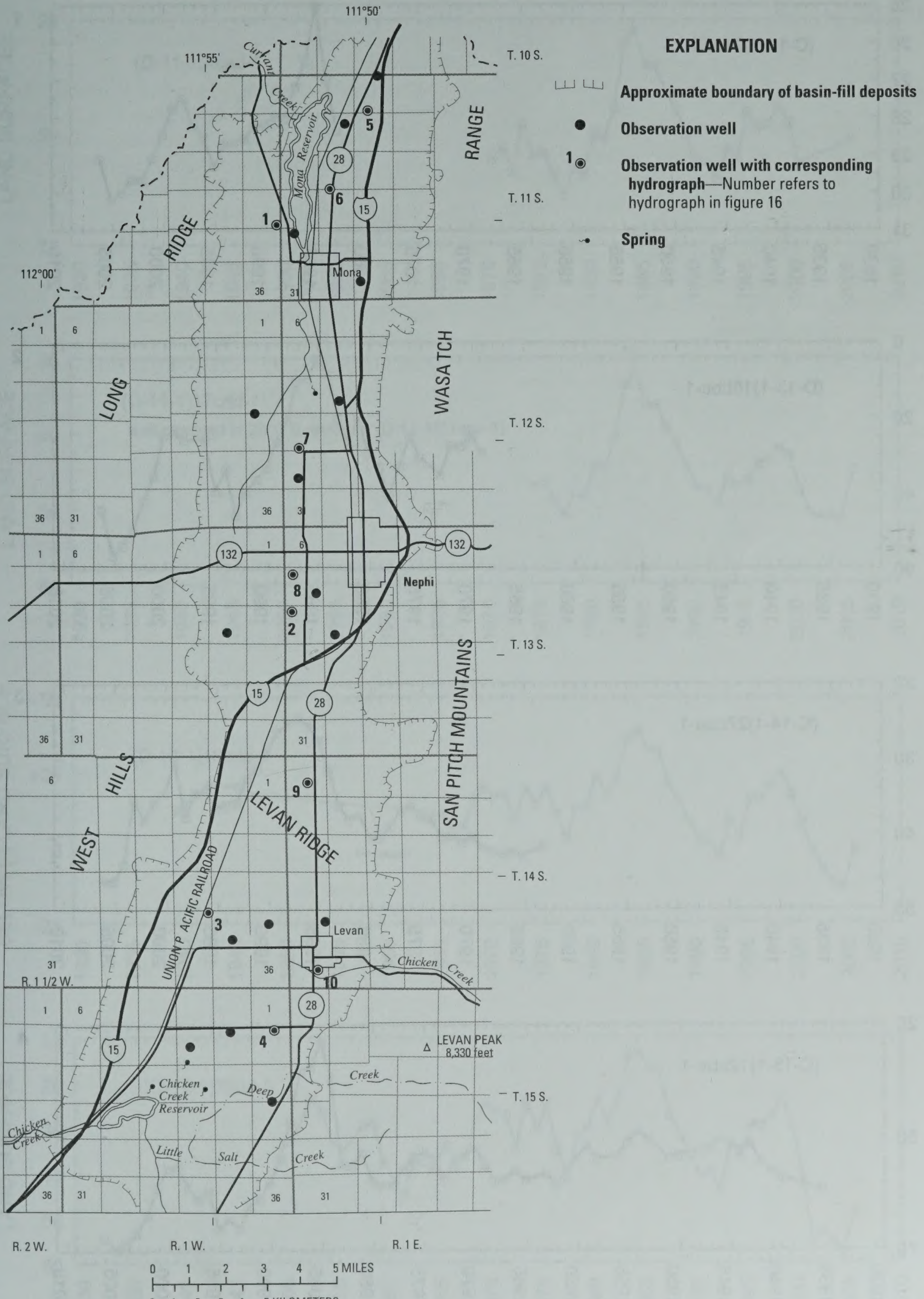


Figure 15. Location of wells in Juab Valley in which the water level was measured during March 2006.

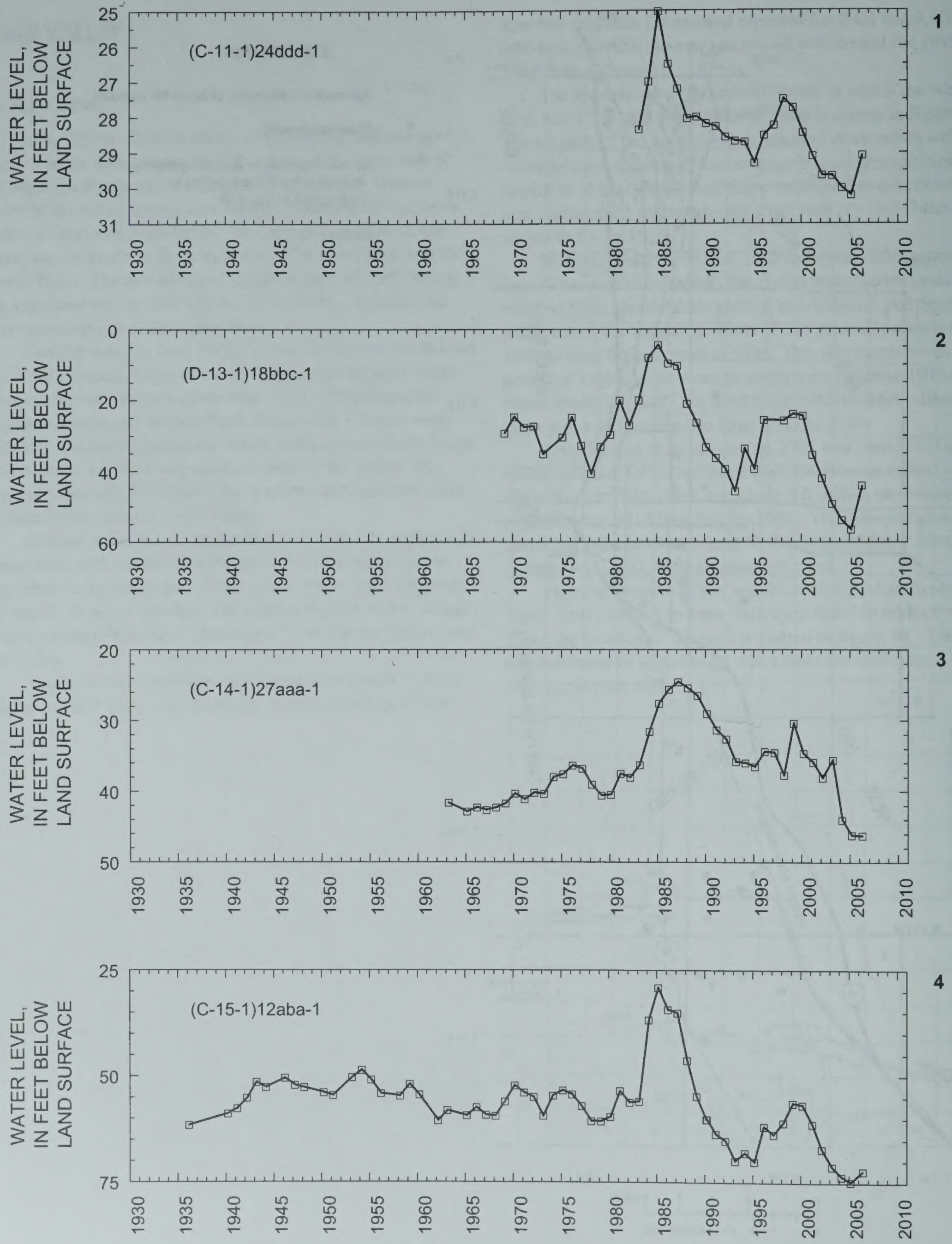


Figure 16. Relation of water level in selected wells in Juab Valley to cumulative departure from average annual precipitation at Nephi, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (D-13-1)7dbc-1.

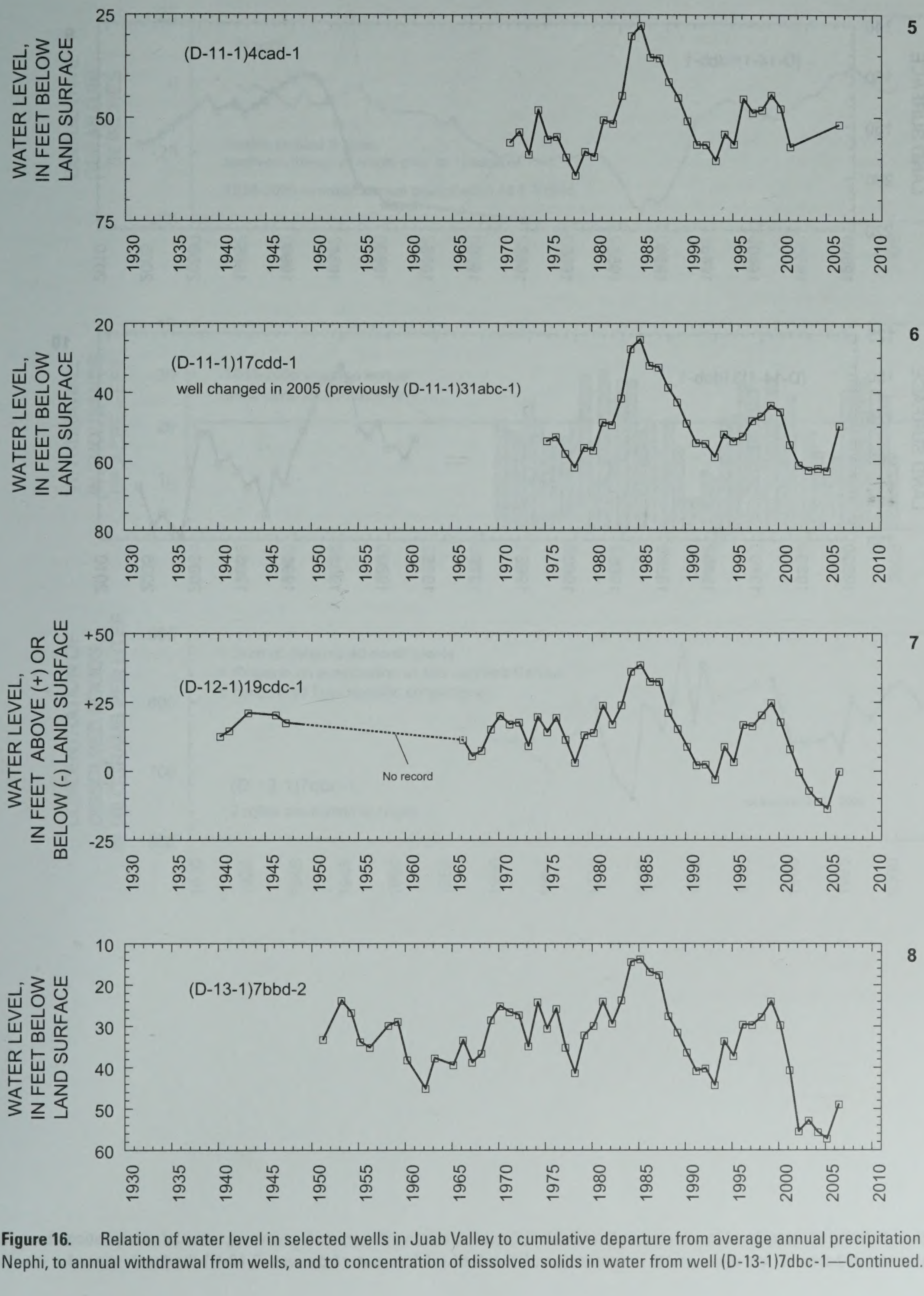
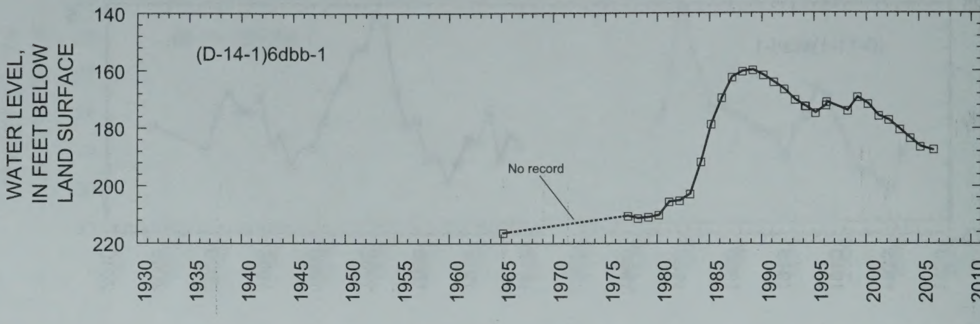
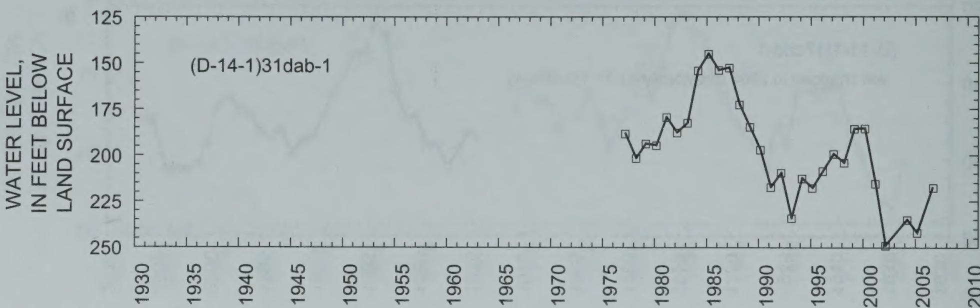


Figure 16. Relation of water level in selected wells in Juab Valley to cumulative departure from average annual precipitation at Nephi, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (D-13-1)7dbc-1—Continued.



9



10

Figure 16. Relation of water level in selected wells in Juab Valley to cumulative departure from average annual precipitation at Nephi, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (D-13-1)7dbc-1—Continued.

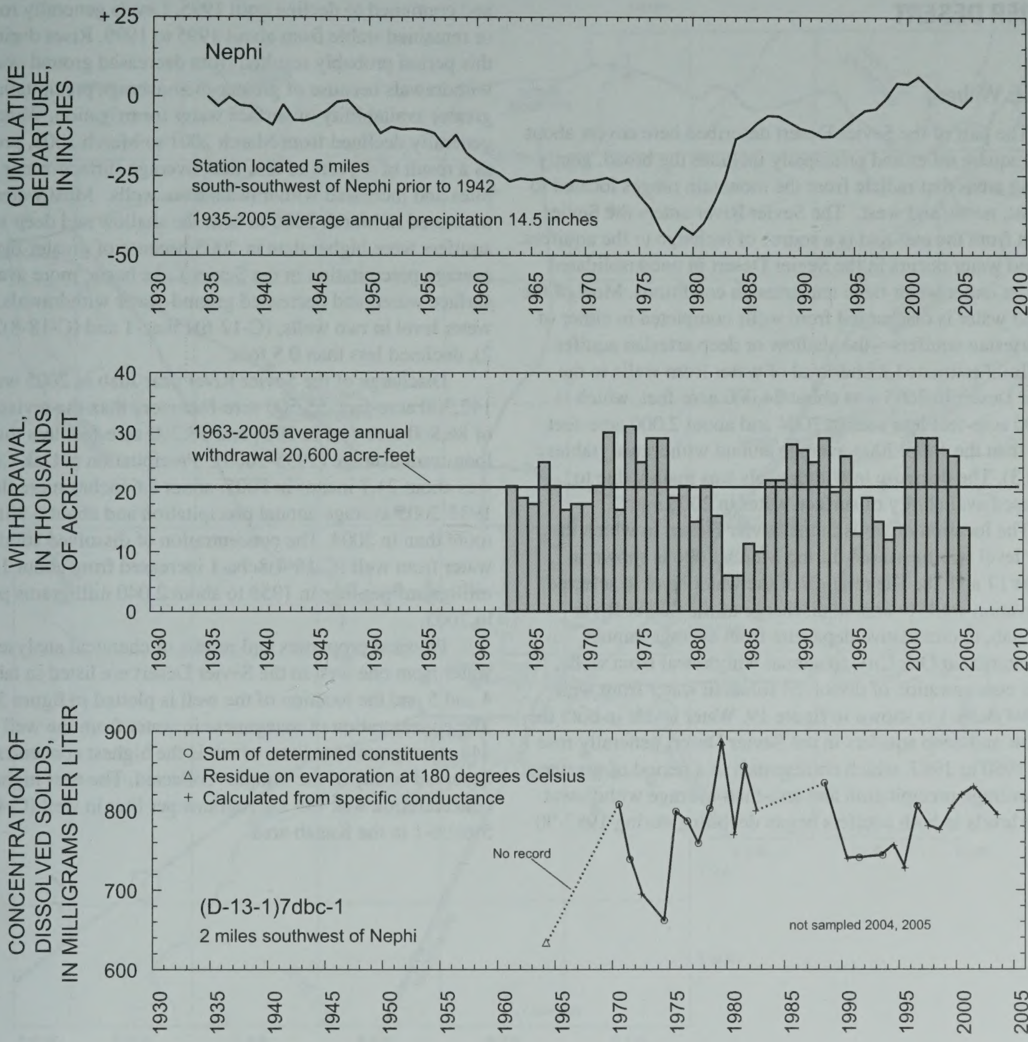


Figure 16. Relation of water level in selected wells in Juab Valley to cumulative departure from average annual precipitation at Nephi, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (D-13-1)7dbc-1—Continued.

SEVIER DESERT

By D.E. Wilberg

The part of the Sevier Desert described here covers about 2,000 square miles and principally includes the broad, gently sloping areas that radiate from the mountain ranges located to the east, north, and west. The Sevier River enters the Sevier Desert from the east and is a source of recharge to the aquifers. Ground water occurs in the Sevier Desert in unconsolidated deposits under water-table and artesian conditions. Most of the ground water is discharged from wells completed in either of two artesian aquifers—the shallow or deep artesian aquifer.

Total estimated withdrawal of water from wells in the Sevier Desert in 2005 was about 24,000 acre-feet, which is 17,000 acre-feet less than in 2004 and about 2,000 acre-feet more than the 1995-2004 average annual withdrawal (tables 2 and 3). The decrease in withdrawals was mainly due to increased availability of surface water in 2005.

The location of wells in the Sevier Desert in which the water level was measured during March 2006 is shown in figures 17 and 18. The relation of the water level in selected observation wells to annual discharge of the Sevier River near Juab, to cumulative departure from average annual precipitation at Oak City, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-15-4)8cba-1 is shown in figure 19. Water levels in both the shallow and deep aquifers in the Sevier Desert generally rose from 1980 to 1987, which corresponds to a period of greater-than-average precipitation and less-than-average withdrawal. Water levels in both aquifers began declining during 1987-90 and continued to decline until 1995. Levels generally rose or remained stable from about 1995 to 1999. Rises during this period probably resulted from decreased ground-water withdrawals because of greater-than-average precipitation, and greater availablility of surface water for irrigation. Water levels generally declined from March 2001 to March 2005, probably as a result of 4 years of less-than-average surface-water supplies and increased withdrawals from wells. Most water levels measured in March 2006 in both the shallow and deep artesian aquifers were higher than in 2005 because of greater-than-average precipitation in the Sevier Lake basin, more available surface water, and decreased ground-water withdrawals. The water level in two wells, (C-12-6)15bac-1 and (C-18-8)24ada-2), declined less than 0.5 foot.

Discharge of the Sevier River near Juab in 2005 was 142,300 acre-feet, 55,500 acre-feet more than the revised total of 86,800 acre-feet in 2004 and 38,200 acre-feet less than the long-term average (1935-2005). Precipitation at Oak City was about 21.7 inches in 2005, about 8.6 inches more than the 1935-2005 average annual precipitation and about 6.8 inches more than in 2004. The concentration of dissolved solids in water from well (C-15-4)8cba-1 increased from about 1,500 milligrams per liter in 1958 to about 2,040 milligrams per liter in 2005.

Physical properties and results of chemical analyses for water from one well in the Sevier Desert are listed in tables 4 and 5 and the location of the well is plotted in figure 39. The concentration of manganese in water from the well was 448 micrograms per liter, which is the highest concentration observed in any of the samples collected. The next highest concentration was 139 micrograms per liter in well (C-44-5)6cbb-1 in the Kanab area.

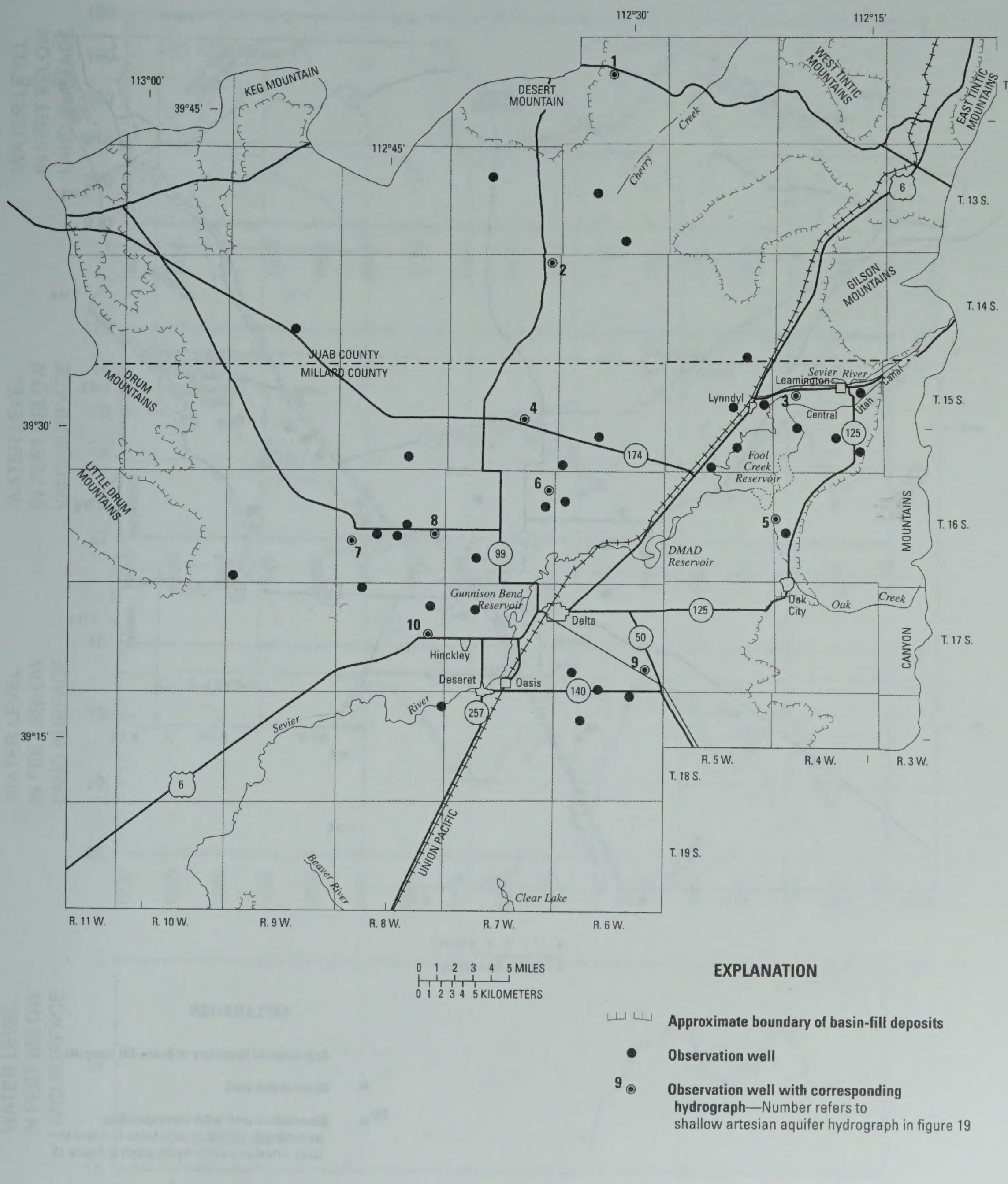
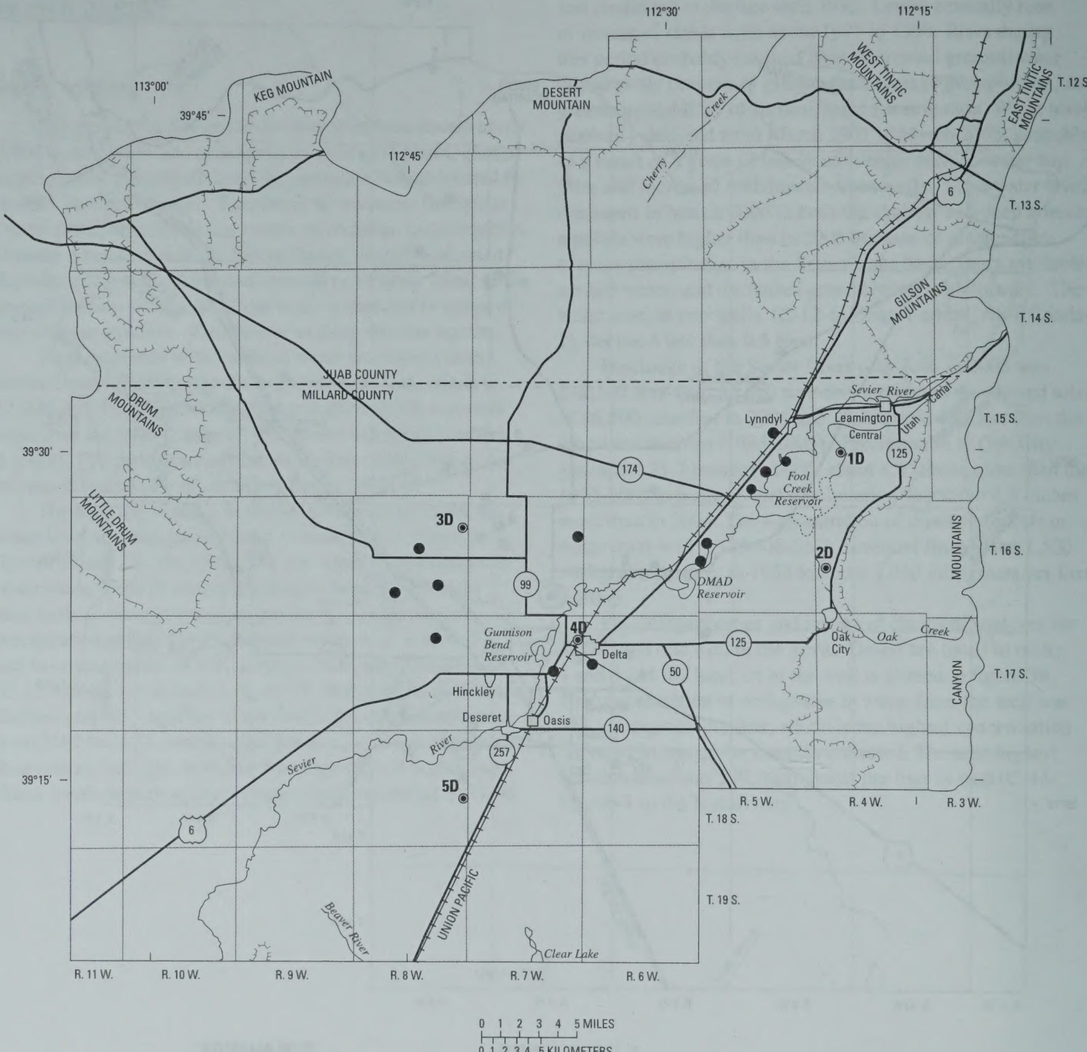


Figure 17. Location of wells in the shallow artesian aquifer in part of the Sevier Desert in which the water level was measured during March 2006.



EXPLANATION

Approximate boundary of basin-fill deposits

Observation well

5D **Observation well with corresponding hydrograph**—Number with letter D refers to deep artesian aquifer hydrograph in figure 19

Figure 18. Location of wells in the deep artesian aquifer in part of the Sevier Desert in which the water level was measured during March 2006.

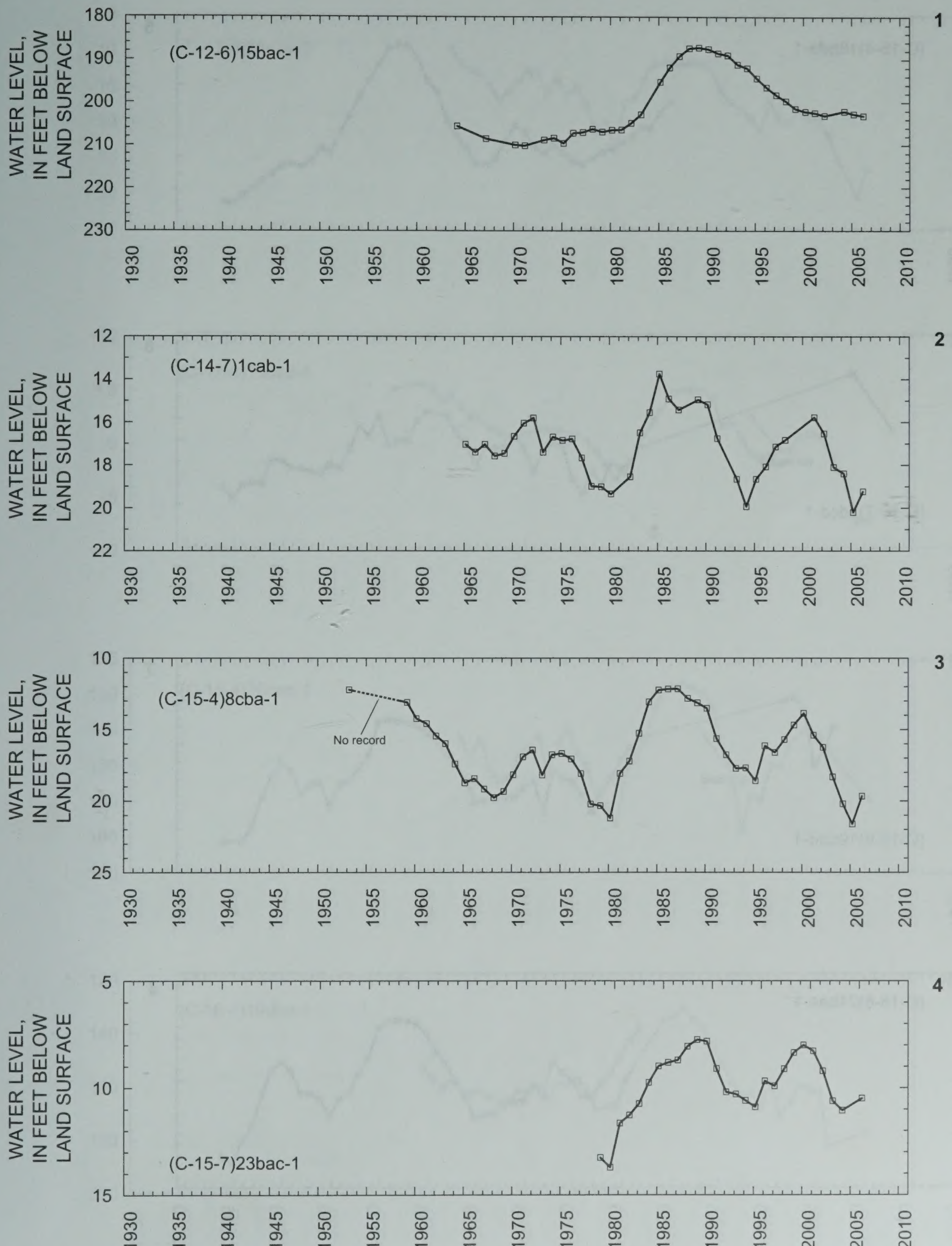


Figure 19. Relation of water level in selected wells in the Sevier Desert to annual discharge of the Sevier River near Juab, to cumulative departure from average annual precipitation at Oak City, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-15-4)8cba-1.

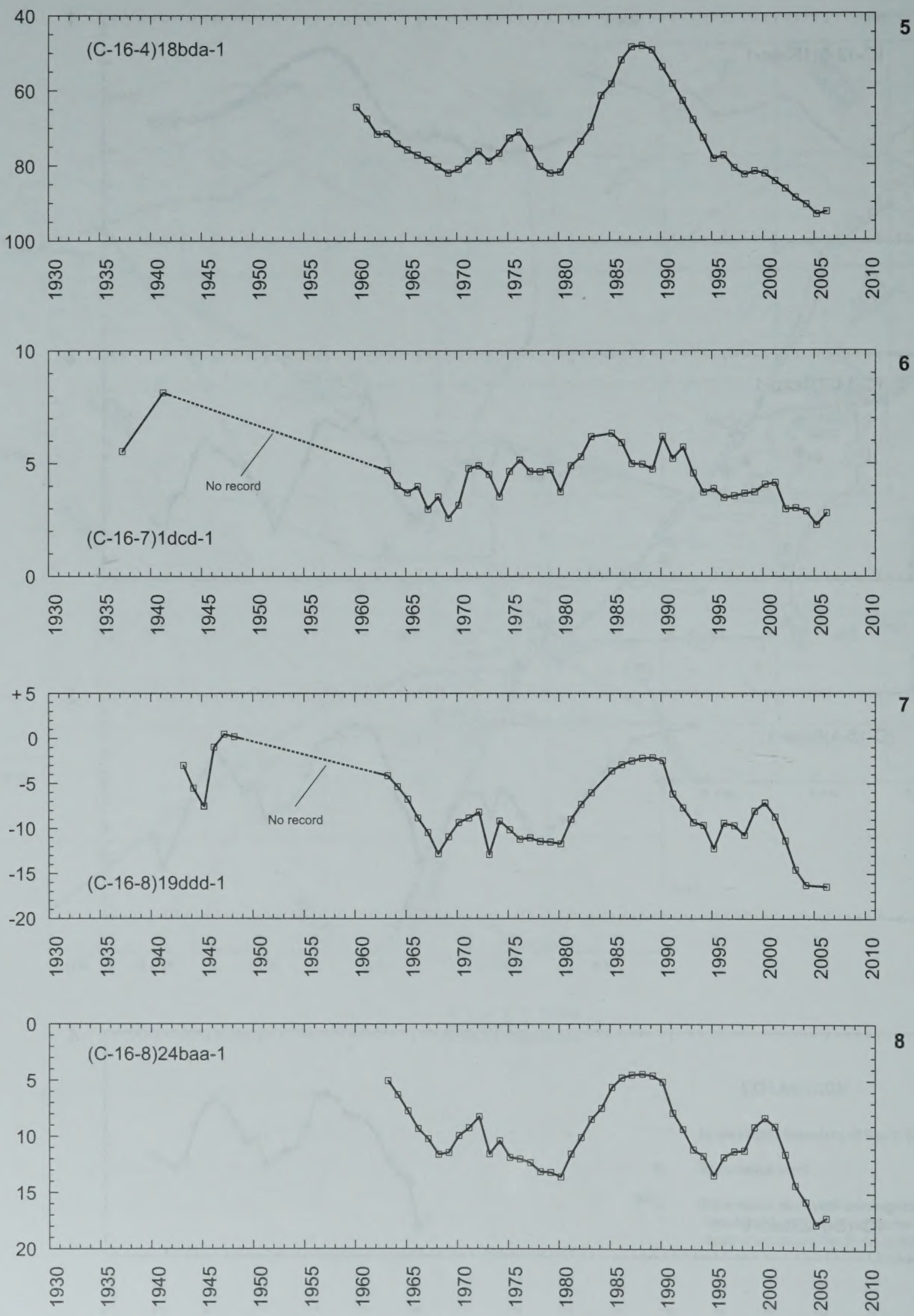


Figure 19. Relation of water level in selected wells in the Sevier Desert to annual discharge of the Sevier River near Juab, to cumulative departure from average annual precipitation at Oak City, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-15-4)8cba-1—Continued.

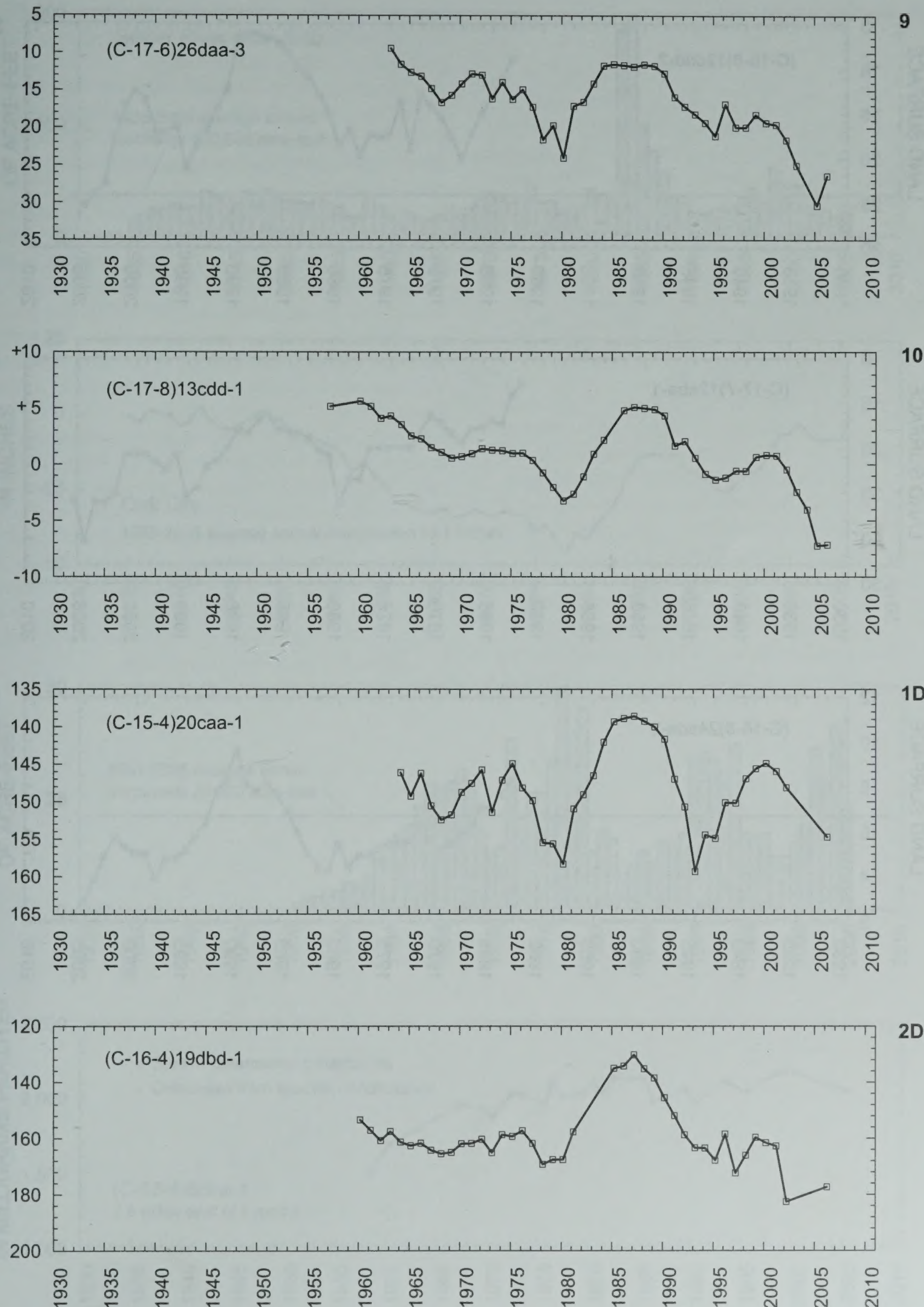


Figure 19. Relation of water level in selected wells in the Sevier Desert to annual discharge of the Sevier River near Juab, to cumulative departure from average annual precipitation at Oak City, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-15-4)8cba-1—Continued.

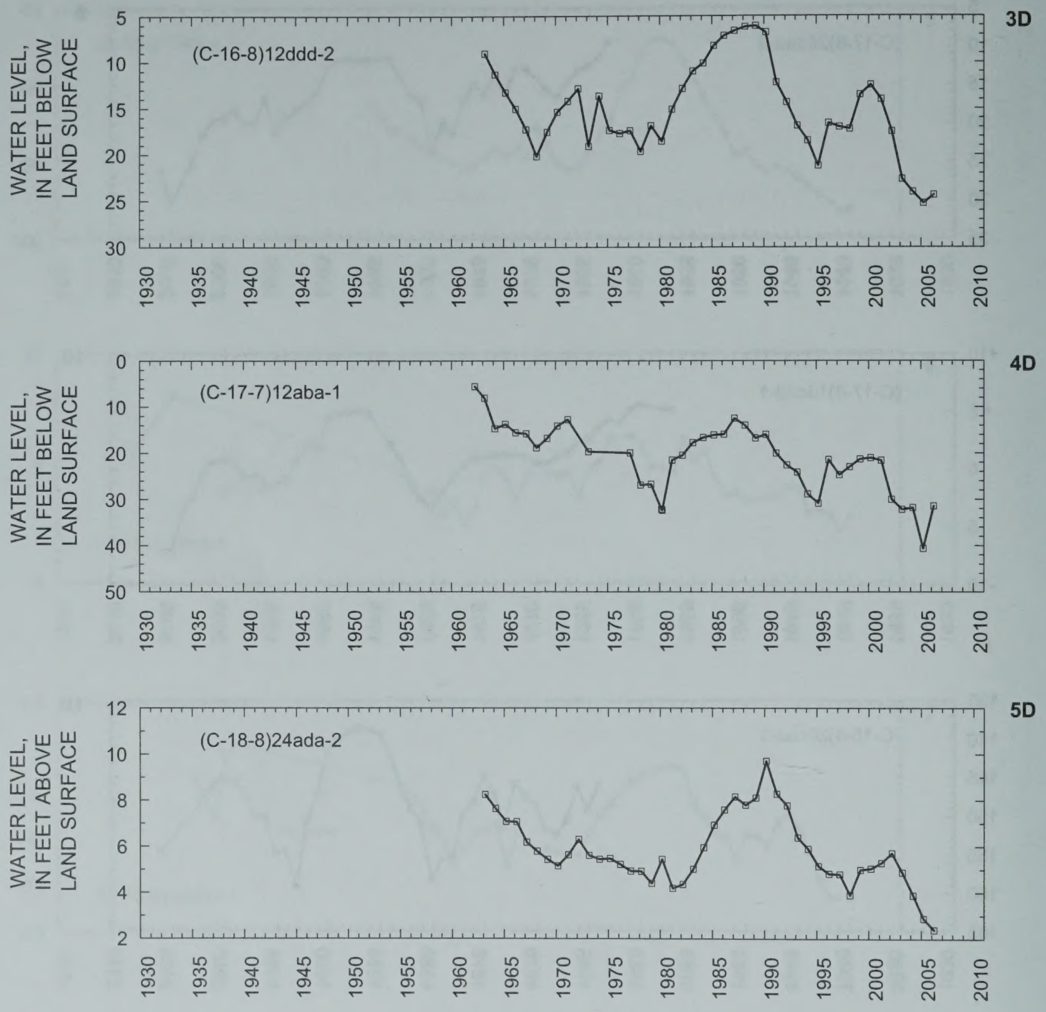


Figure 19. Relation of water level in selected wells in the Sevier Desert to annual discharge of the Sevier River near Juab, to cumulative departure from average annual precipitation at Oak City, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-15-4)8cba-1—Continued.

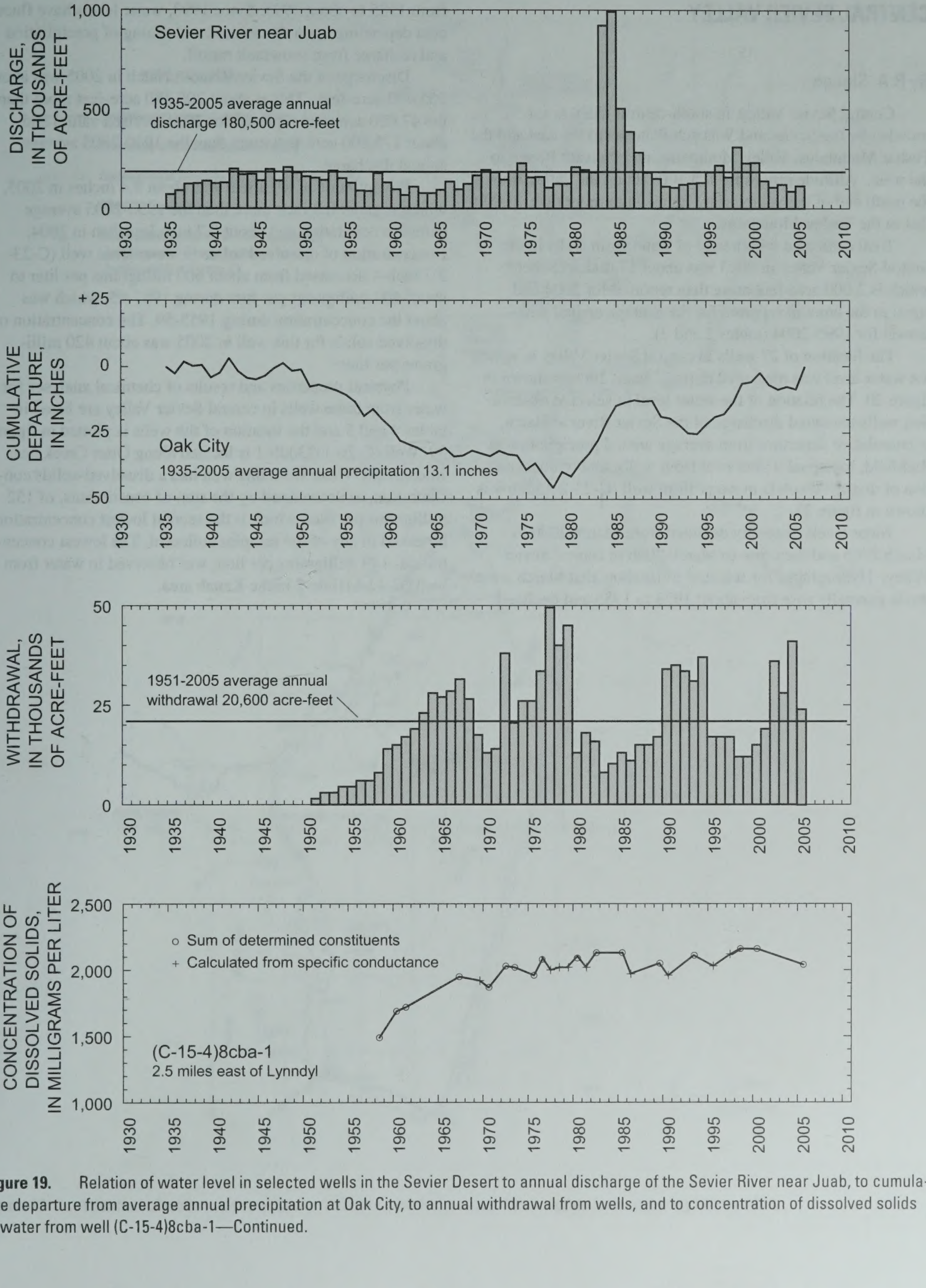


Figure 19. Relation of water level in selected wells in the Sevier Desert to annual discharge of the Sevier River near Juab, to cumulative departure from average annual precipitation at Oak City, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-15-4)8cba-1—Continued.

CENTRAL SEVIER VALLEY

By B.A. Slaugh

Central Sevier Valley, in south-central Utah, is surrounded by the Sevier and Wasatch Plateaus to the east and the Tushar Mountains, Valley Mountains, and Pahvant Range to the west. Altitude ranges from 5,100 feet on the valley floor at the north end of the valley near Gunnison to more than 12,000 feet in the Tushar Mountains.

Total estimated withdrawal of water from wells in the central Sevier Valley in 2005 was about 17,000 acre-feet, which is 2,000 acre-feet more than reported for 2004 and equal to the amount reported for the average annual withdrawal for 1995-2004 (tables 2 and 3).

The location of 27 wells in central Sevier Valley in which the water level was measured during March 2006 is shown in figure 20. The relation of the water level in selected observation wells to annual discharge of the Sevier River at Hatch, to cumulative departure from average annual precipitation at Richfield, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-23-2)15dcb-4 is shown in figure 21.

Water levels generally declined from March 2000 to March 2005 and then rose to March 2006 in central Sevier Valley. Hydrographs for selected wells show that March water levels generally rose from about 1978 to 1985 and declined from 1985 to about 1993. Since 1993, water levels have fluctuated depending upon the amount and timing of precipitation and recharge from snowmelt runoff.

Discharge of the Sevier River at Hatch in 2005 was about 255,400 acre-feet. This is about 208,380 acre-feet more than the 47,020 acre-feet reported for 2004 (revised value) and about 175,600 acre-feet more than the 1940-2005 average annual discharge.

Precipitation at Richfield was about 8.4 inches in 2005, which is about 0.3 inch more than the 1950-2005 average annual precipitation and about 0.7 inch less than in 2004. Concentration of dissolved solids in water from well (C-23-2)15dcb-4 decreased from about 600 milligrams per liter to about 400 milligrams per liter during 1987-95, which was about the concentration during 1955-59. The concentration of dissolved solids for this well in 2005 was about 420 milligrams per liter.

Physical properties and results of chemical analyses for water from three wells in central Sevier Valley are listed in tables 4 and 5 and the location of the wells is plotted in figure 39. Well (C-26-1)23ddb-1 is located along Otter Creek near Koosharem. Water from this well had a dissolved-solids concentration, as determined by the sum of constituents, of 152 milligrams per liter, which is the second lowest concentration observed in any of the samples collected. The lowest concentration, 149 milligrams per liter, was observed in water from well (C-42-6)1bdc-2 in the Kanab area.

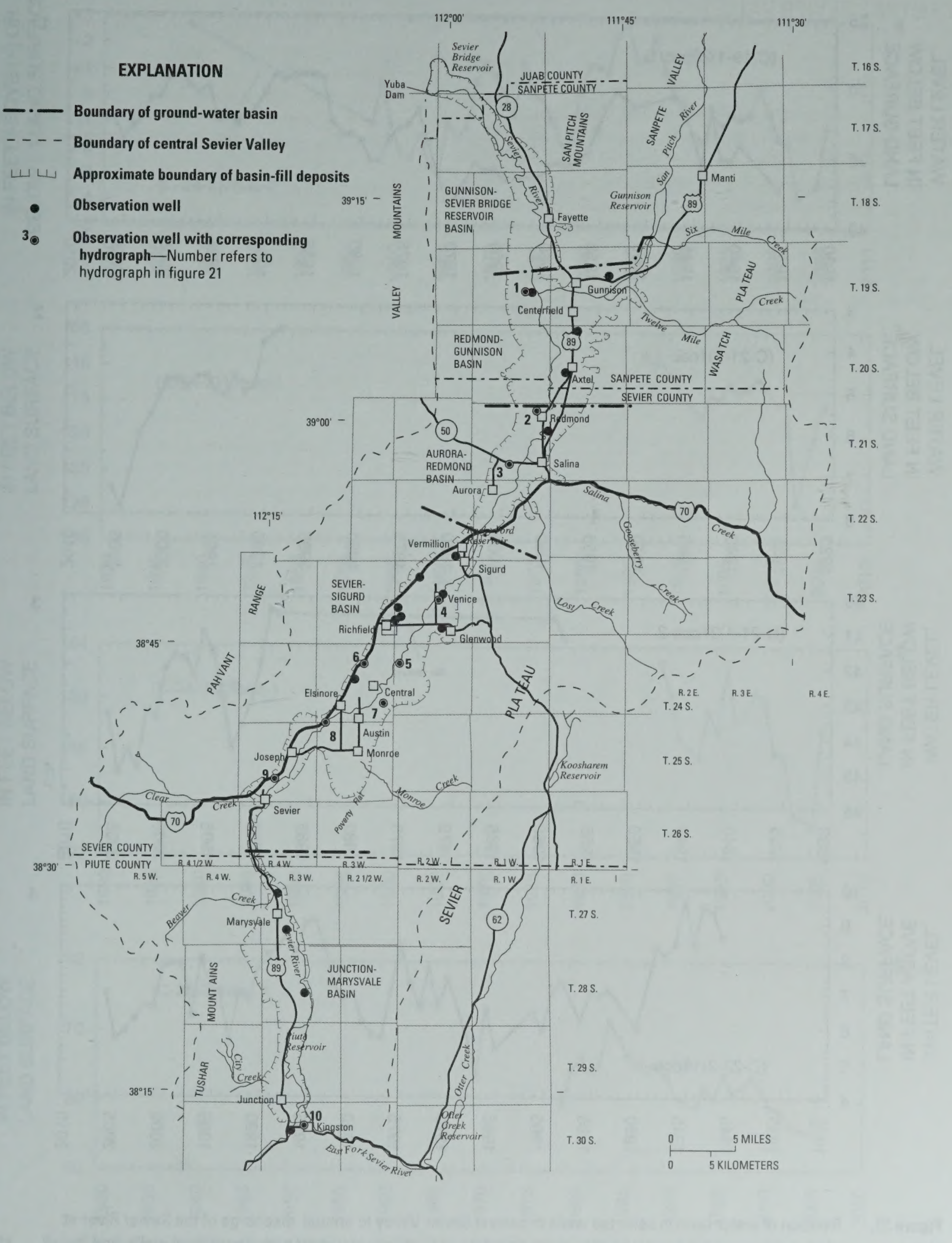


Figure 20. Location of wells in central Sevier Valley in which the water level was measured during March 2006.

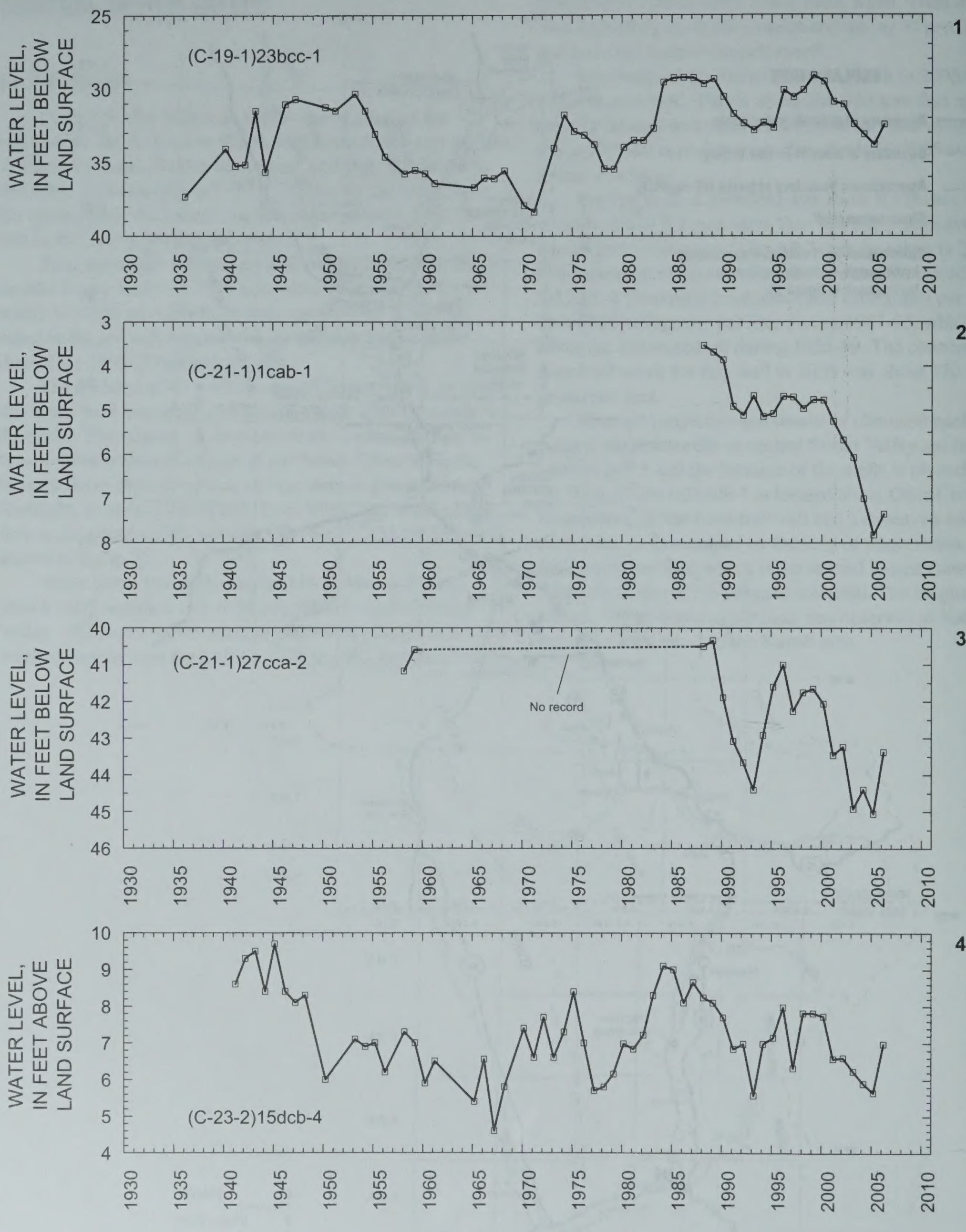
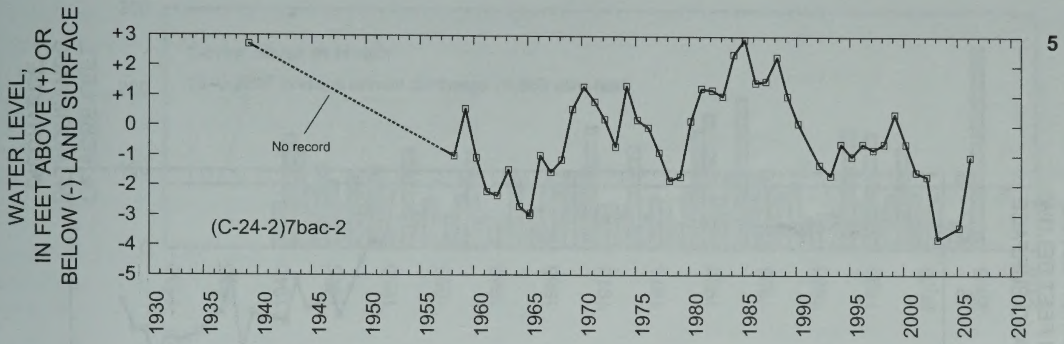
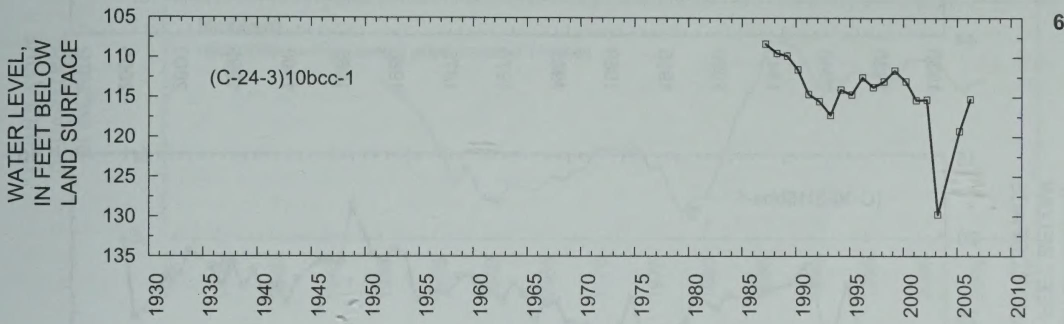
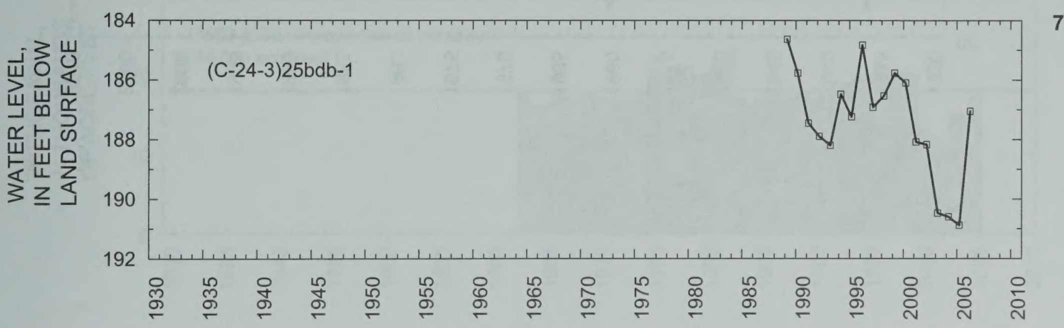


Figure 21. Relation of water level in selected wells in central Sevier Valley to annual discharge of the Sevier River at Hatch, to cumulative departure from average annual precipitation at Richfield, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-23-2)15dcb-4.







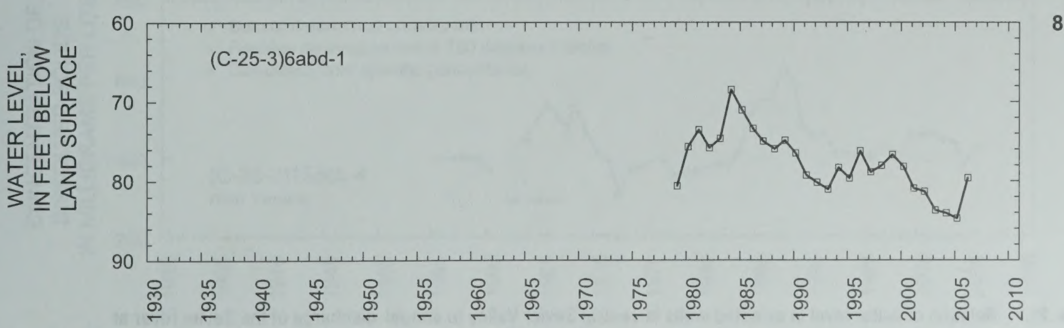
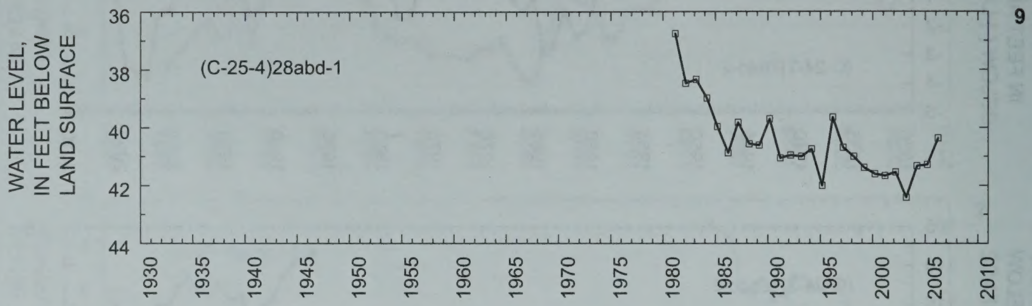


Figure 21. Relation of water level in selected wells in central Sevier Valley to annual discharge of the Sevier River at Hatch, to cumulative departure from average annual precipitation at Richfield, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-23-2)15dcb-4—Continued.



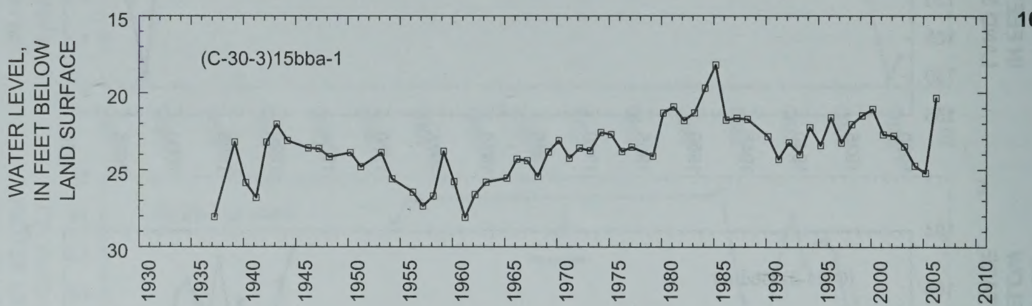


Figure 21. Relation of water level in selected wells in central Sevier Valley to annual discharge of the Sevier River at Hatch, to cumulative departure from average annual precipitation at Richfield, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-23-2)15dcb-4—Continued.

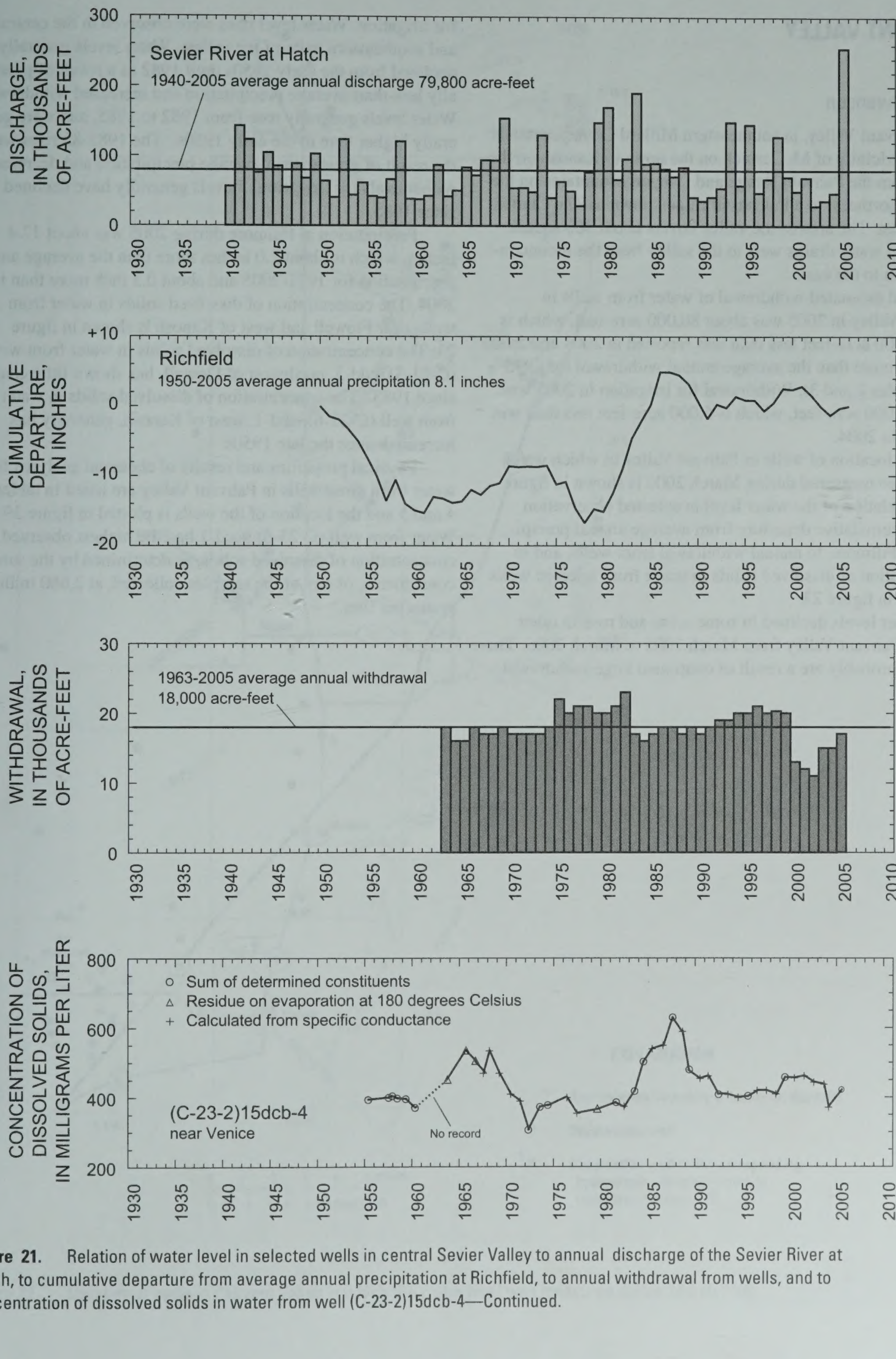


Figure 21. Relation of water level in selected wells in central Sevier Valley to annual discharge of the Sevier River at Hatch, to cumulative departure from average annual precipitation at Richfield, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-23-2)15dcb-4—Continued.

PAHVANT VALLEY

By R.L. Swenson

Pahvant Valley, in southeastern Millard County, extends from the vicinity of McCornick on the north to Kanosh on the south, from the Pahvant Range and Canyon Mountains on the east and northeast to a low basalt ridge known as The Cinders on the west. The area of the valley covers about 300 square miles, and water drains west to the valley from the mountainous terrain to the east.

Total estimated withdrawal of water from wells in Pahvant Valley in 2005 was about 80,000 acre-feet, which is about 5,000 acre-feet less than was reported in 2004 and 2,000 acre-feet more than the average annual withdrawal for 1995-2004 (tables 2 and 3). Withdrawal for irrigation in 2005 was about 79,000 acre-feet, which is 5,000 acre-feet less than was reported in 2004.

The location of wells in Pahvant Valley in which water levels were measured during March 2006 is shown in figure 22. The relation of the water level in selected observation wells to cumulative departure from average annual precipitation at Fillmore, to annual withdrawal from wells, and to concentration of dissolved solids in water from selected wells is shown in figure 23.

Water levels declined in some areas and rose in other areas in Pahvant Valley from March 2005 to March 2006. The declines probably are a result of continued large withdrawals for irrigation. Water-level rises were observed in the central and southeastern parts of the valley. Water levels generally declined from the early 1950s until 1982 as a result of generally less-than-average precipitation and increased withdrawals. Water levels generally rose from 1982 to 1985, and were generally higher than in the early 1950s. The 1982-85 rises were the result of greater-than-average precipitation and decreased withdrawals for irrigation. Levels generally have declined since 1985.

Precipitation at Fillmore during 2005 was about 17.4 inches, which is about 2.0 inches more than the average annual precipitation for 1931-2005 and about 0.3 inch more than in 2004. The concentration of dissolved solids in water from wells near Flowell and west of Kanosh is shown in figure 23. The concentration of dissolved solids in water from well (C-21-5)7cdd-3, northwest of Flowell, has shown little change since 1983. The concentration of dissolved solids in water from well (C-23-6)8abd-1, west of Kanosh, generally has increased since the late 1950s.

Physical properties and results of chemical analyses for water from three wells in Pahvant Valley are listed in tables 4 and 5 and the location of the wells is plotted in figure 39. Water from well (C-23-6) 9ccd-1 had the highest observed concentration of dissolved solids, as determined by the sum of constituents, of any of the samples collected, at 2,660 milligrams per liter.

Figure 22. Location of wells in Pahvant Valley in which the water level was measured during March 2006.

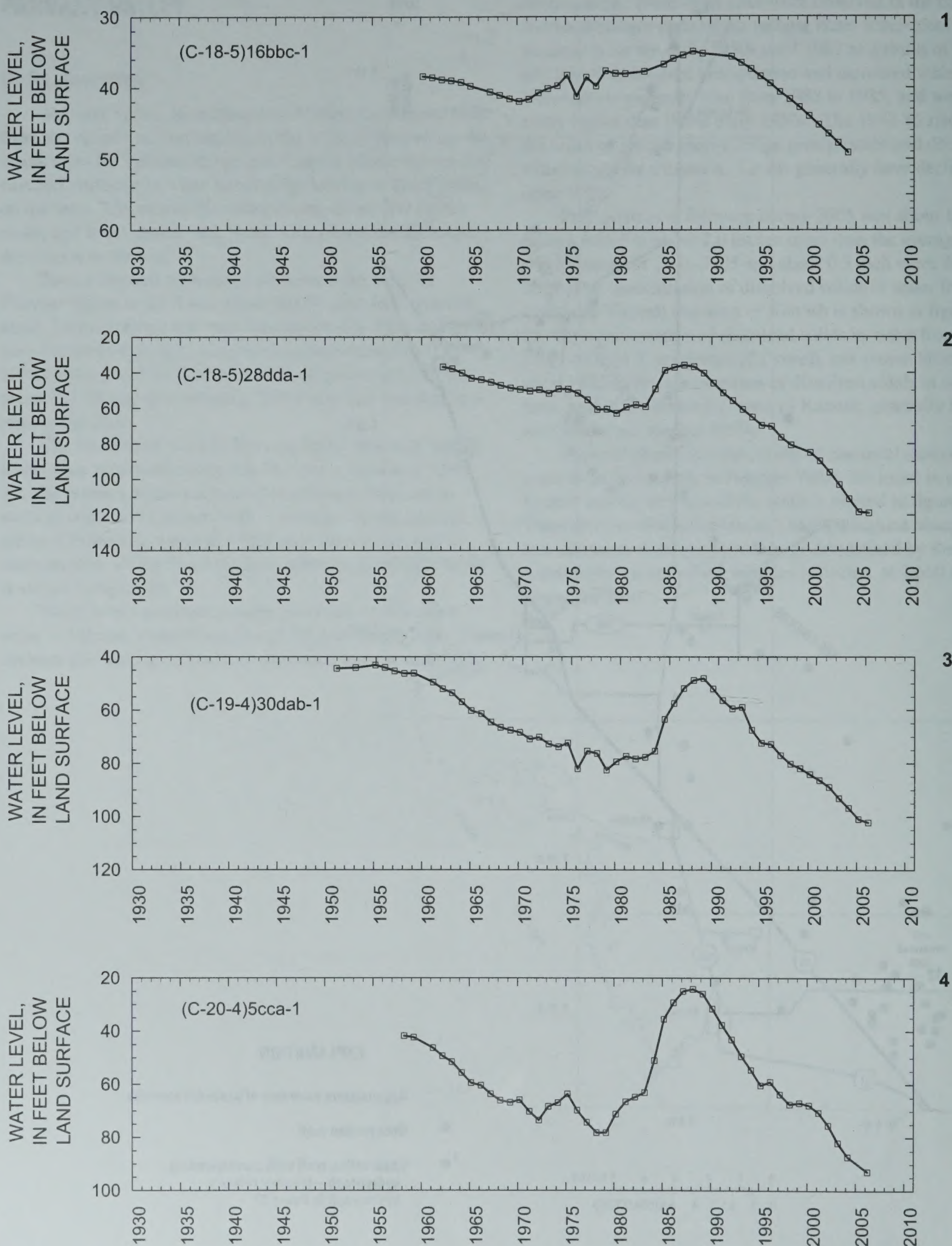


Figure 23. Relation of water level in selected wells in Pahvant Valley to cumulative departure from average annual precipitation at Fillmore, to annual withdrawal from wells, and to concentration of dissolved solids in water from selected wells.

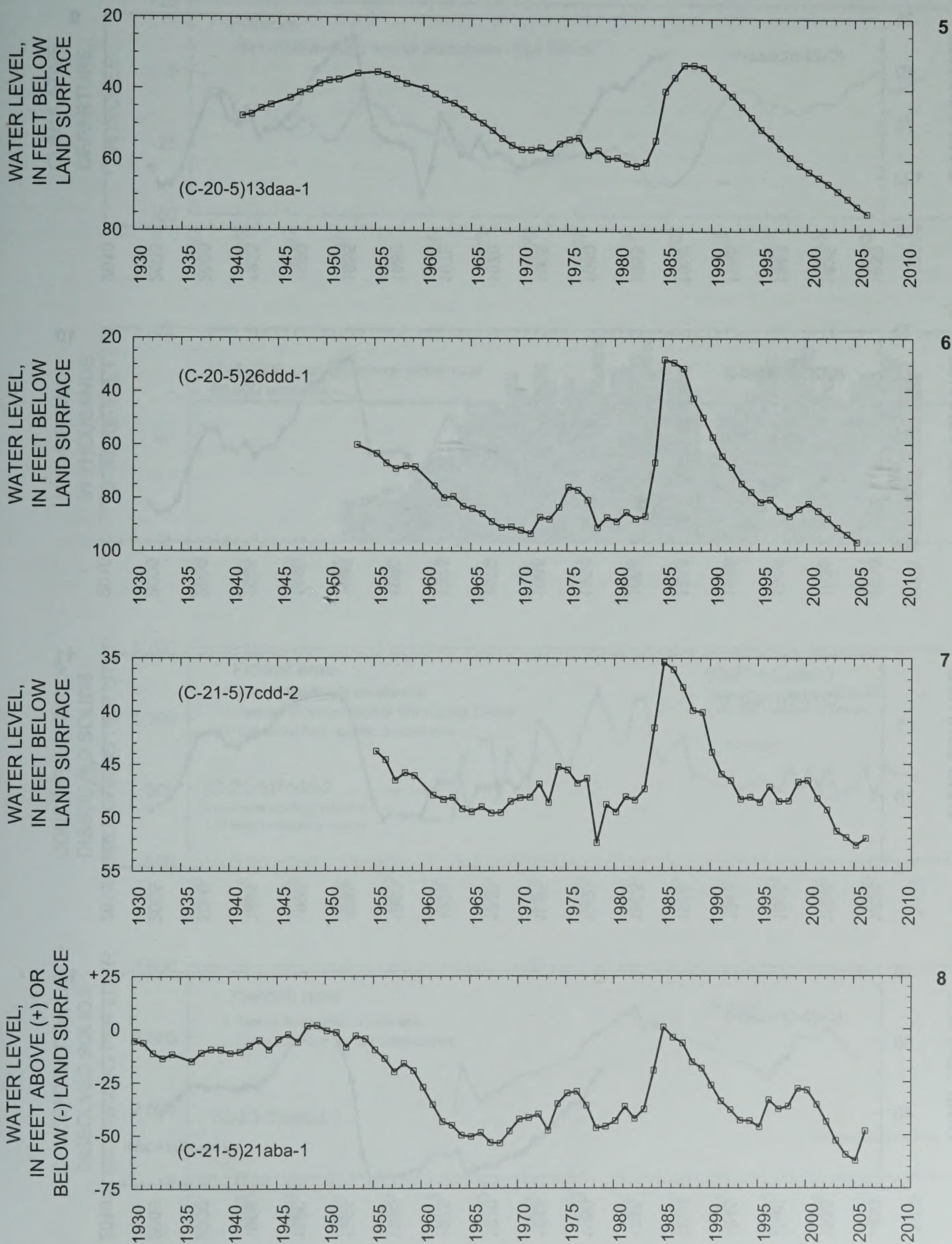


Figure 23. Relation of water level in selected wells in Pahvant Valley to cumulative departure from average annual precipitation at Fillmore, to annual withdrawal from wells, and to concentration of dissolved solids in water from selected wells —Continued.

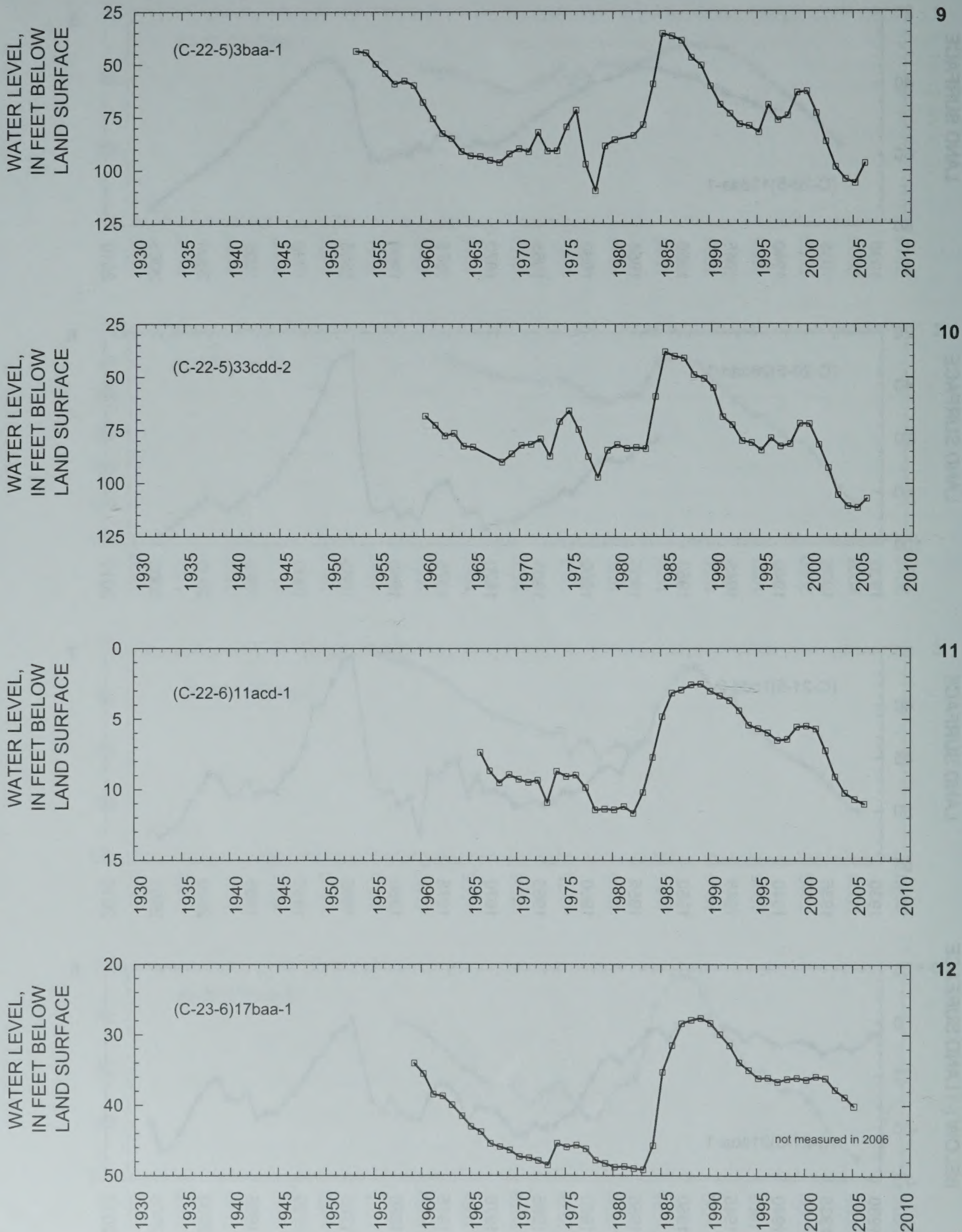


Figure 23. Relation of water level in selected wells in Pahvant Valley to cumulative departure from average annual precipitation at Fillmore, to annual withdrawal from wells, and to concentration of dissolved solids in water from selected wells—Continued.

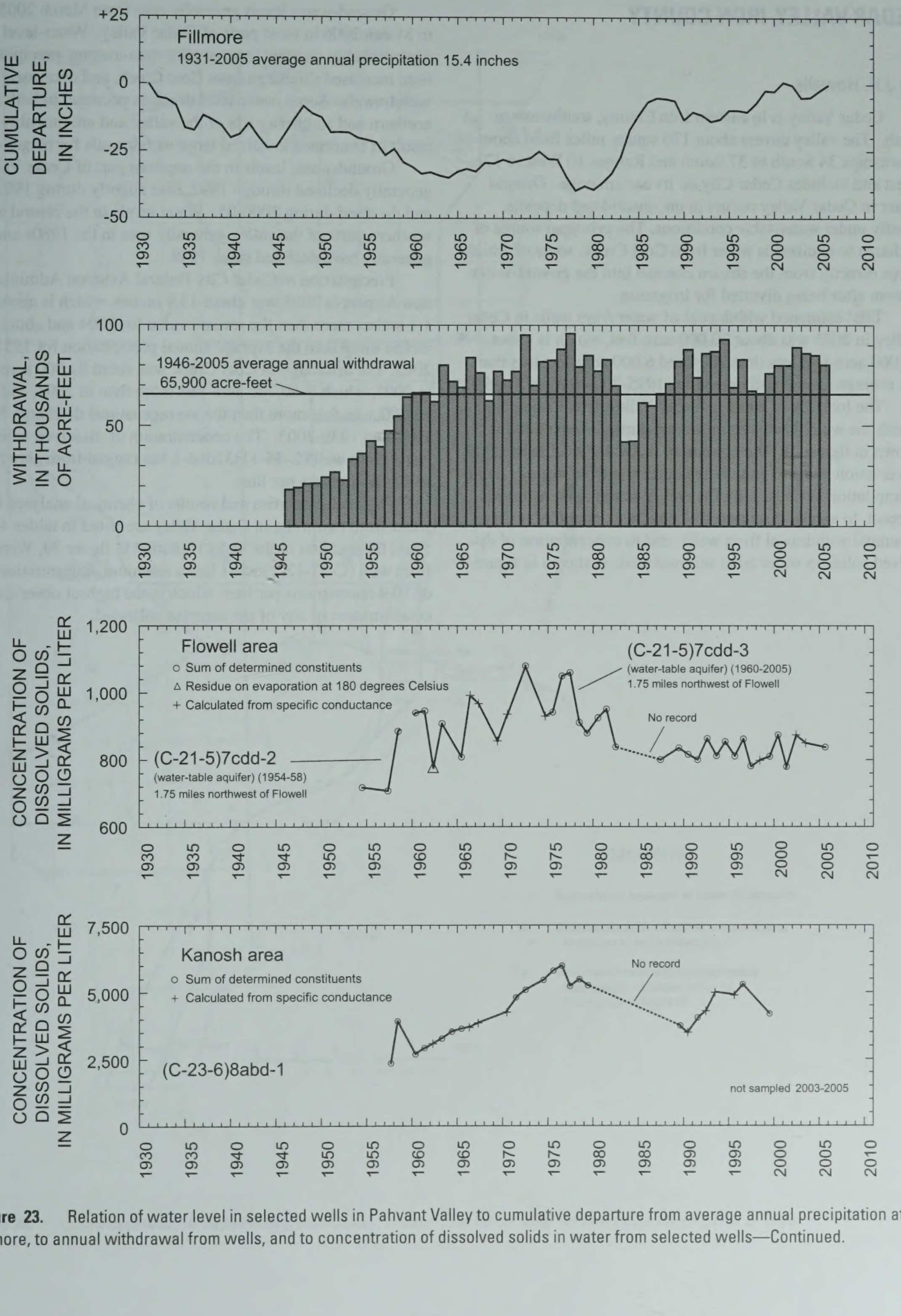


Figure 23. Relation of water level in selected wells in Pahvant Valley to cumulative departure from average annual precipitation at Fillmore, to annual withdrawal from wells, and to concentration of dissolved solids in water from selected wells—Continued.

CEDAR VALLEY, IRON COUNTY

By J.H. Howells

Cedar Valley is in eastern Iron County, southwestern Utah. The valley covers about 170 square miles from about Townships 34 South to 37 South and Ranges 10 West to 12 West and includes Cedar City on its eastern edge. Ground water in Cedar Valley occurs in unconsolidated deposits, mostly under water-table conditions. The principal source of recharge to aquifers is water from Coal Creek, some of which seeps directly from the stream channel into the ground-water system after being diverted for irrigation.

Total estimated withdrawal of water from wells in Cedar Valley in 2005 was about 30,000 acre-feet, which is about 10,000 acre-feet less than 2004 and 6,000 acre-feet less than the average annual withdrawal for 1995-2004 (tables 2 and 3).

The location of wells in Cedar Valley, Iron County, in which the water level was measured during March 2006 is shown in figure 24. The relation of the water level in selected observation wells to cumulative departure from average annual precipitation at Cedar City Federal Aviation Administration Airport, to annual discharge of Coal Creek near Cedar City, to annual withdrawal from wells, and to concentration of dissolved solids in water from selected wells is shown in figure 25.

Ground-water levels generally rose from March 2005 to March 2006 in most parts of Cedar Valley. Water-level rises probably resulted from greater-than-average precipitation, increased discharge from Coal Creek, and decreased withdrawals. Some water-level declines occurred in both the northern and southern parts of the valley and are probably the result of continued localized large withdrawals for irrigation.

Ground-water levels in the northern part of Cedar Valley generally declined through 1992, rose slightly during 1993-99, and declined during 2000-05. Water levels in the central and southern parts of the valley generally rose in the 1980s and generally have declined since 1989.

Precipitation at Cedar City Federal Aviation Administration Airport in 2005 was about 13.9 inches, which is about 1.1 inches more than the revised value for 2004 and about 3.2 inches more than the average annual precipitation for 1951-2005. The discharge of Coal Creek was about 81,000 acre-feet in 2005, which is 60,700 acre-feet more than in 2004, and 56,500 acre-feet more than the average annual discharge for 1936 and 1939-2005. The concentration of dissolved solids in water from well (C-35-11)31dbd-1 has ranged from about 350 to 700 milligrams per liter.

Physical properties and results of chemical analyses for water from two wells in Cedar Valley are listed in tables 4 and 5 and the location of the wells is plotted in figure 39. Water from well (C-37-12)23acb-1 had a selenium concentration of 10.0 micrograms per liter, which is the highest observed concentration of any of the samples collected.

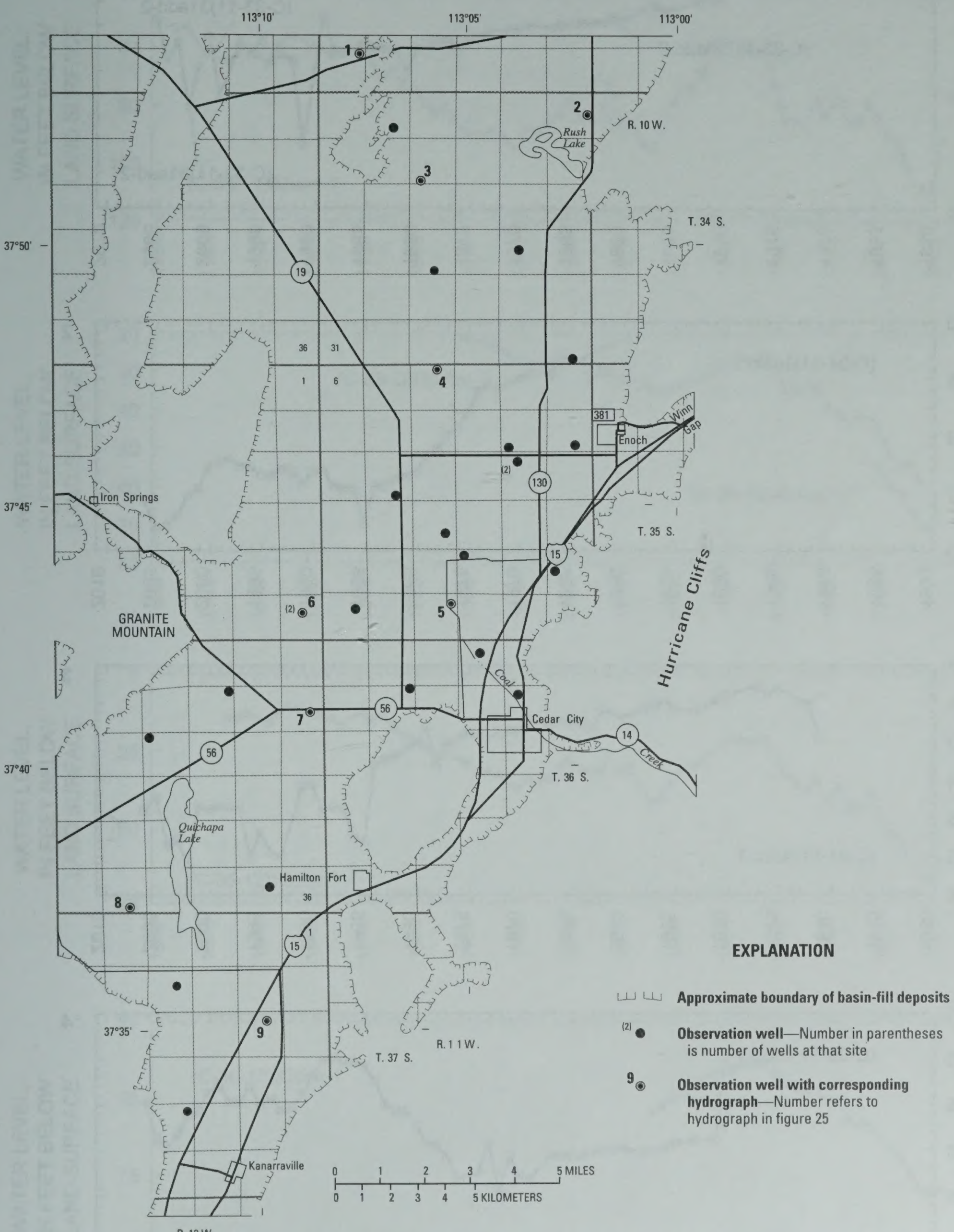


Figure 24. Location of wells in Cedar Valley, Iron County, in which the water level was measured during March 2006.

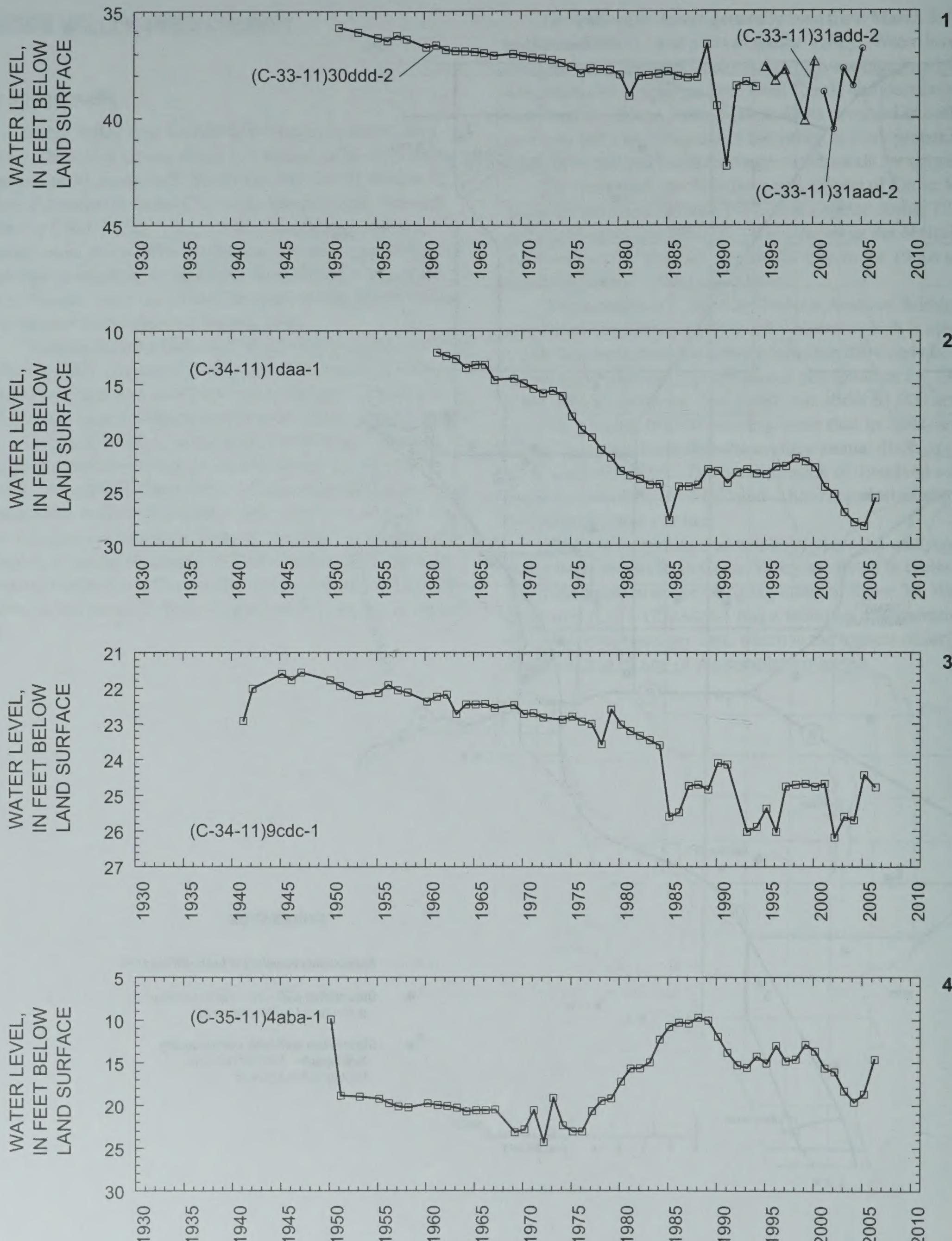


Figure 25. Relation of water level in selected wells in Cedar Valley, Iron County, to cumulative departure from average annual precipitation at Cedar City Federal Aviation Administration Airport, to annual discharge of Coal Creek near Cedar City, to annual withdrawal from wells, and to concentration of dissolved solids in water from selected wells.

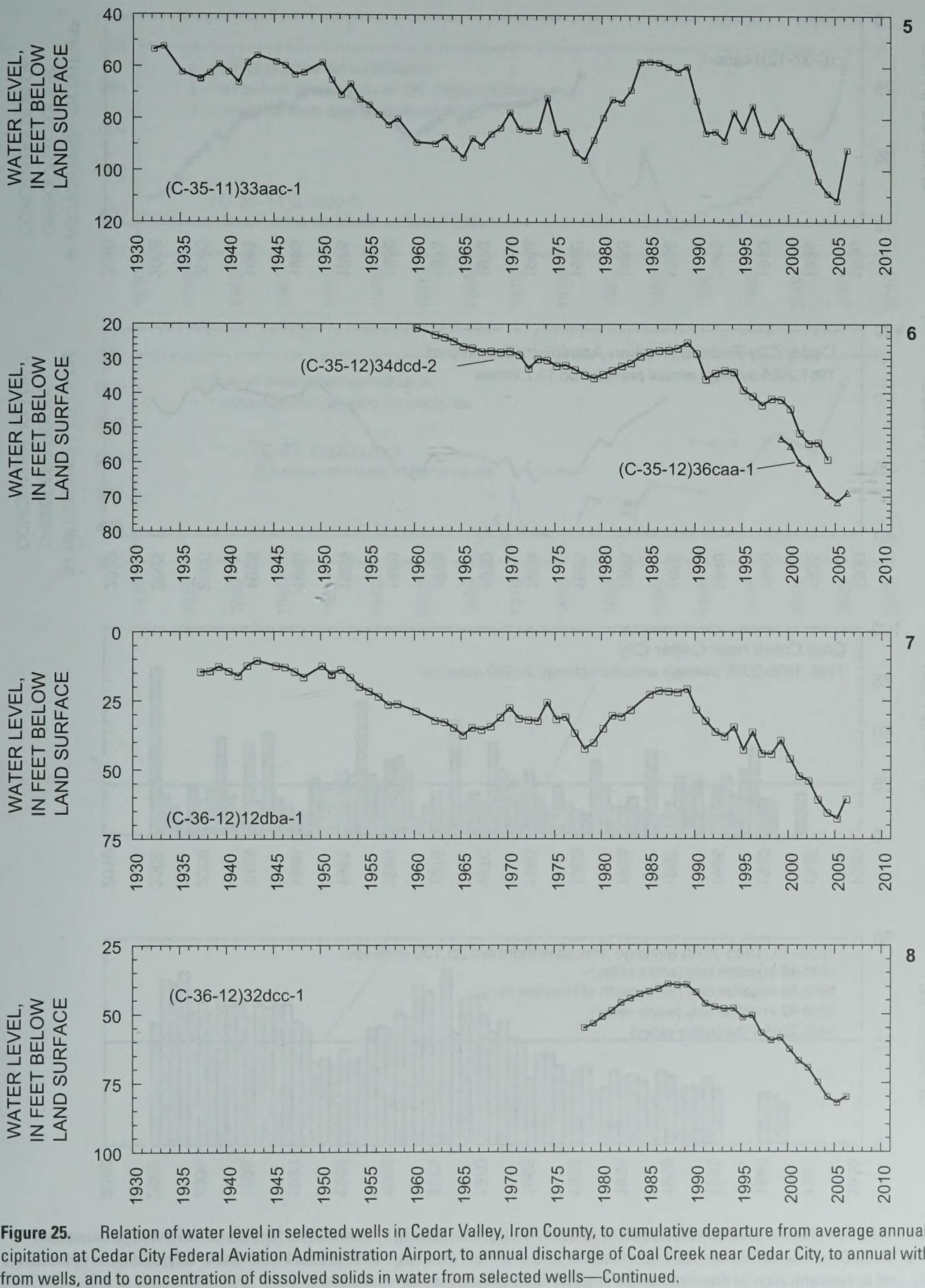


Figure 25. Relation of water level in selected wells in Cedar Valley, Iron County, to cumulative departure from average annual precipitation at Cedar City Federal Aviation Administration Airport, to annual discharge of Coal Creek near Cedar City, to annual withdrawal from wells, and to concentration of dissolved solids in water from selected wells—Continued.

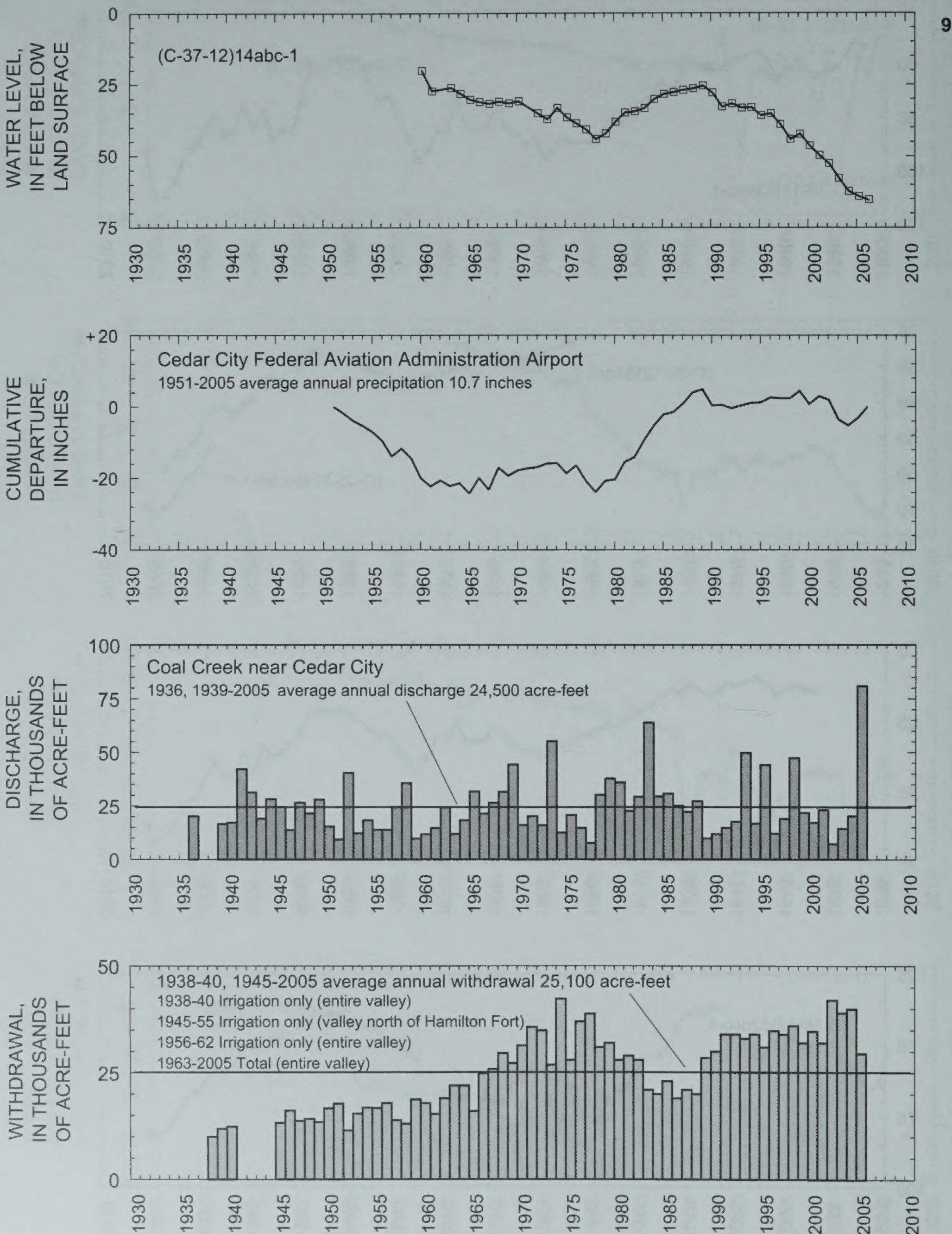


Figure 25. Relation of water level in selected wells in Cedar Valley, Iron County, to cumulative departure from average annual precipitation at Cedar City Federal Aviation Administration Airport, to annual discharge of Coal Creek near Cedar City, to annual withdrawal from wells, and to concentration of dissolved solids in water from selected wells—Continued.

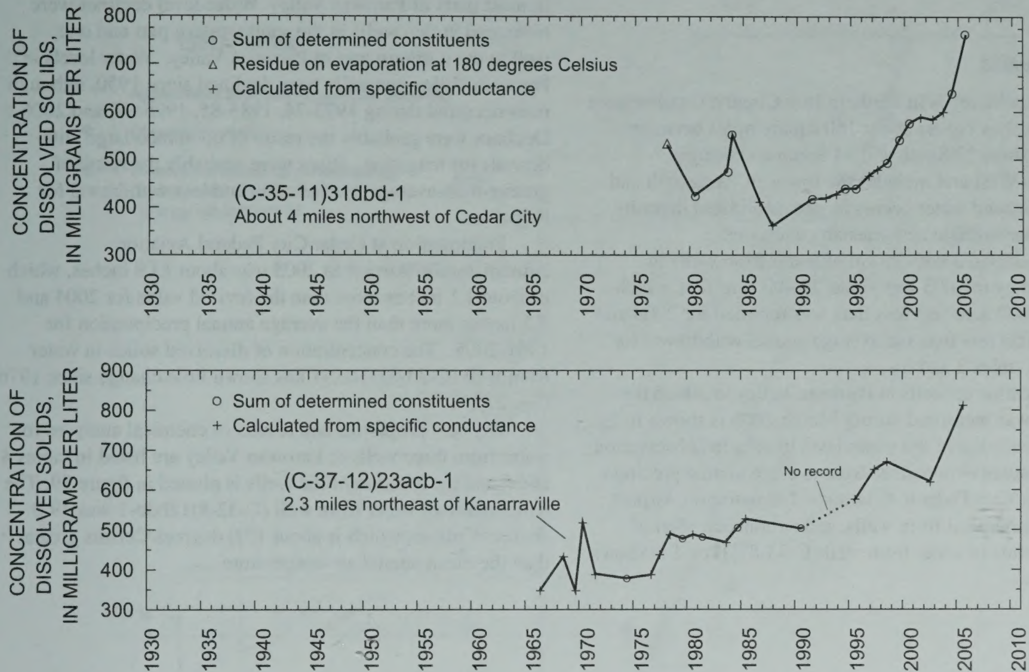


Figure 25. Relation of water level in selected wells in Cedar Valley, Iron County, to cumulative departure from average annual precipitation at Cedar City Federal Aviation Administration Airport, to annual discharge of Coal Creek near Cedar City, to annual withdrawal from wells, and to concentration of dissolved solids in water from selected wells—Continued.

PAROWAN VALLEY

By J.H. Howells

Parowan Valley is in northern Iron County, southwestern Utah. The valley covers about 160 square miles between about Townships 32 South and 34 South and Ranges 7 West and 10 West and includes the towns of Paragonah and Parowan. Ground water occurs in unconsolidated deposits under both water-table and artesian conditions.

Total estimated withdrawal of water from wells in Parowan Valley in 2005 was about 27,000 acre-feet, which is about 10,000 acre-feet less than was reported for 2004 and 3,000 acre-feet less than the average annual withdrawal for 1995-2004 (tables 2 and 3).

The location of wells in Parowan Valley in which the water level was measured during March 2006 is shown in figure 26. The relation of the water level in selected observation wells to cumulative departure from average annual precipitation at Cedar City Federal Aviation Administration Airport, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-33-8)31ccc-1 is shown in figure 27.

Water levels rose from March 2005 to March 2006 in most parts of Parowan Valley. Water-level declines were measured in two wells in the southwestern part and one well in the northern part of Parowan Valley. Water levels in Parowan Valley generally have declined since 1950, although rises occurred during 1973-74, 1983-85, 1996-99, and 2006. Declines were probably the result of continued large withdrawals for irrigation. Rises were probably the result of greater-than-average precipitation and less withdrawal for irrigation.

Precipitation at Cedar City Federal Aviation Administration Airport in 2005 was about 13.9 inches, which is about 1.1 inches more than the revised value for 2004 and 3.2 inches more than the average annual precipitation for 1951-2005. The concentration of dissolved solids in water from well (C-33-8)31ccc-1 has shown little change since 1976 (fig. 27).

Physical properties and results of chemical analyses for water from three wells in Parowan Valley are listed in tables 4 and 5 and the location of the wells is plotted in figure 39. The temperature of water from well (C-32-8)12bdb-1 was 19.0 degrees Celsius, which is about 10.0 degrees Celsius greater than the mean annual air temperature.

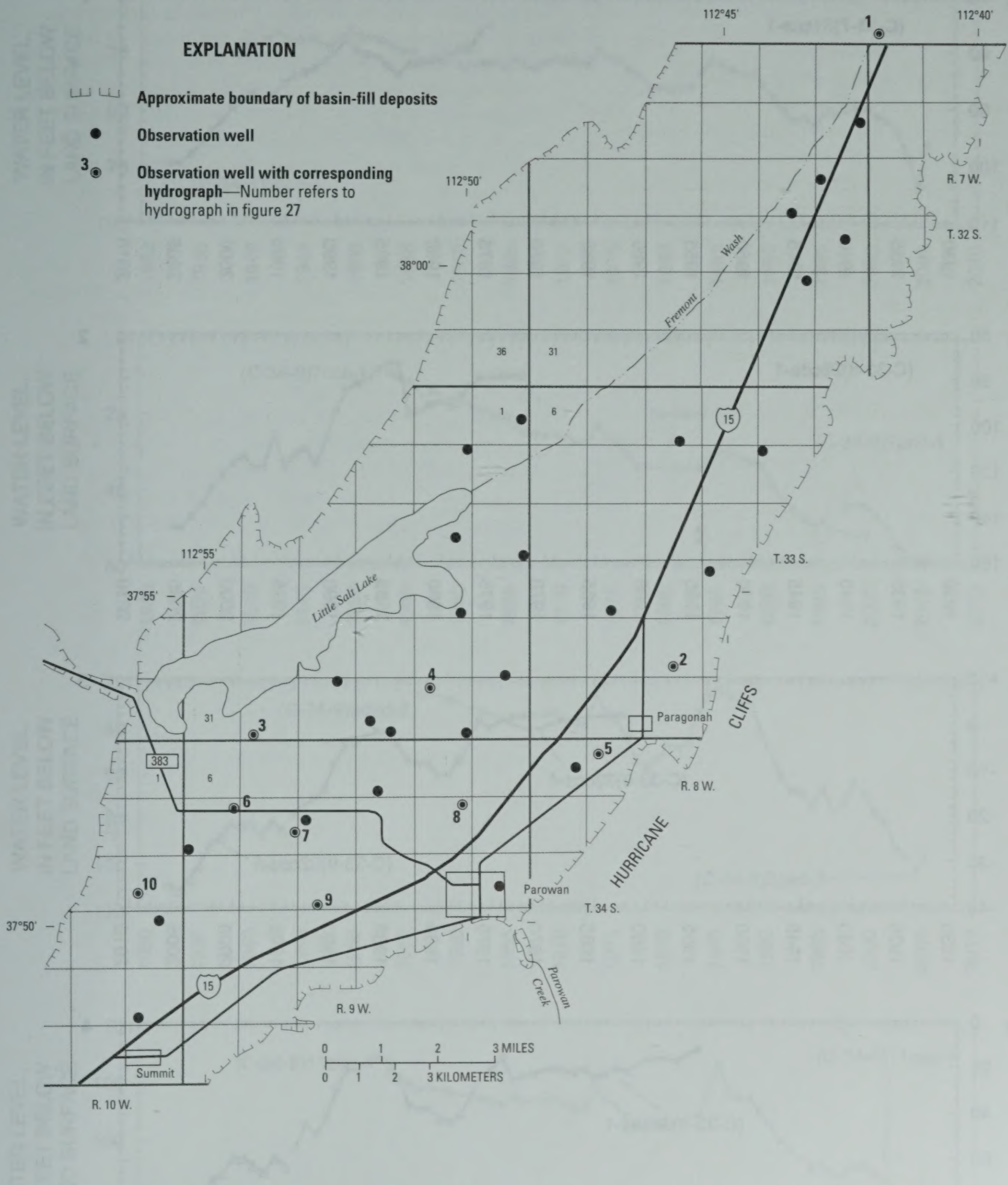


Figure 26. Location of wells in Parowan Valley in which the water level was measured during March 2006.

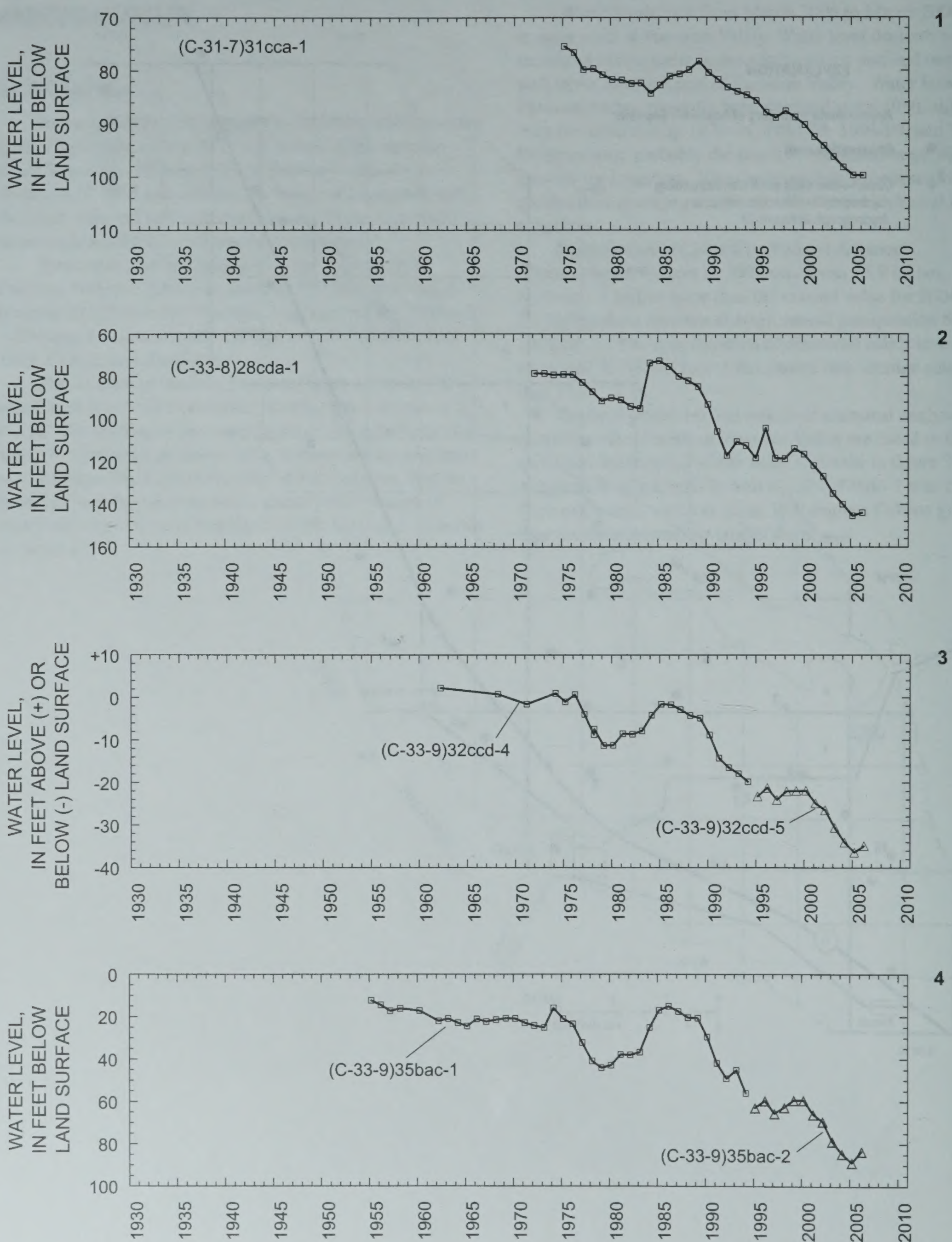


Figure 27. Relation of water level in selected wells in Parowan Valley to cumulative departure from average annual precipitation at Cedar City Federal Aviation Administration Airport, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-33-8)31ccc-1.

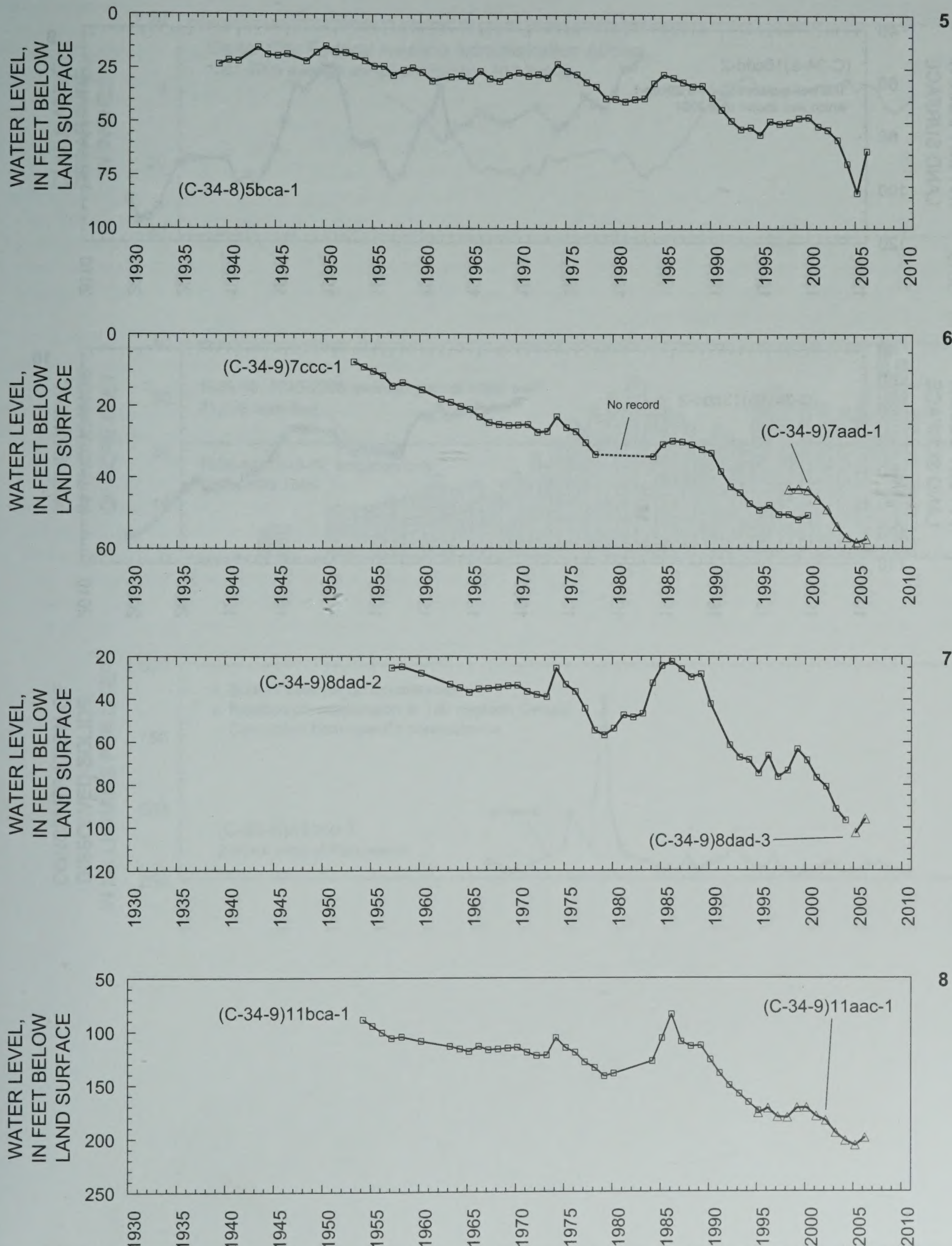
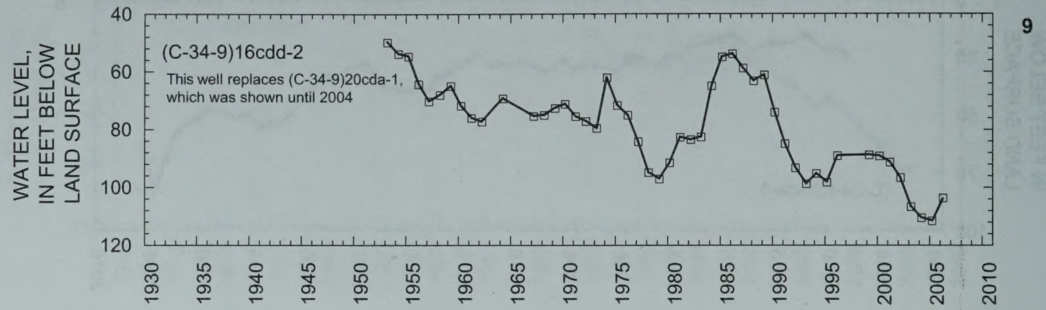


Figure 27. Relation of water level in selected wells in Parowan Valley to cumulative departure from average annual precipitation at Cedar City Federal Aviation Administration Airport, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-33-8)31ccc-1—Continued.



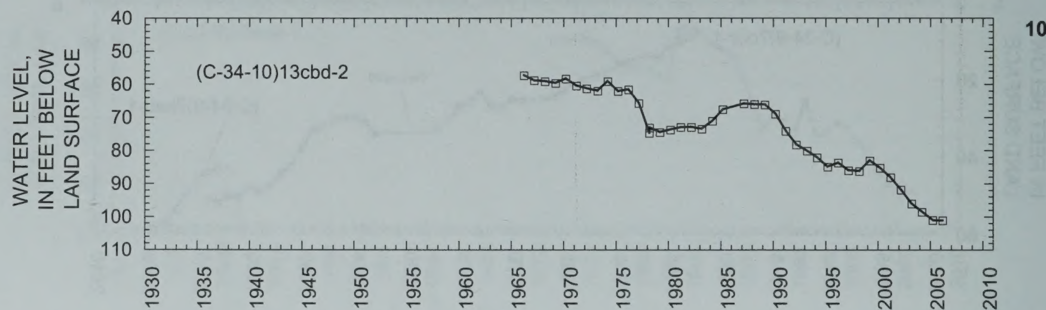


Figure 27. Relation of water level in selected wells in Parowan Valley to cumulative departure from average annual precipitation at Cedar City Federal Aviation Administration Airport, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-33-8)31ccc-1—Continued.

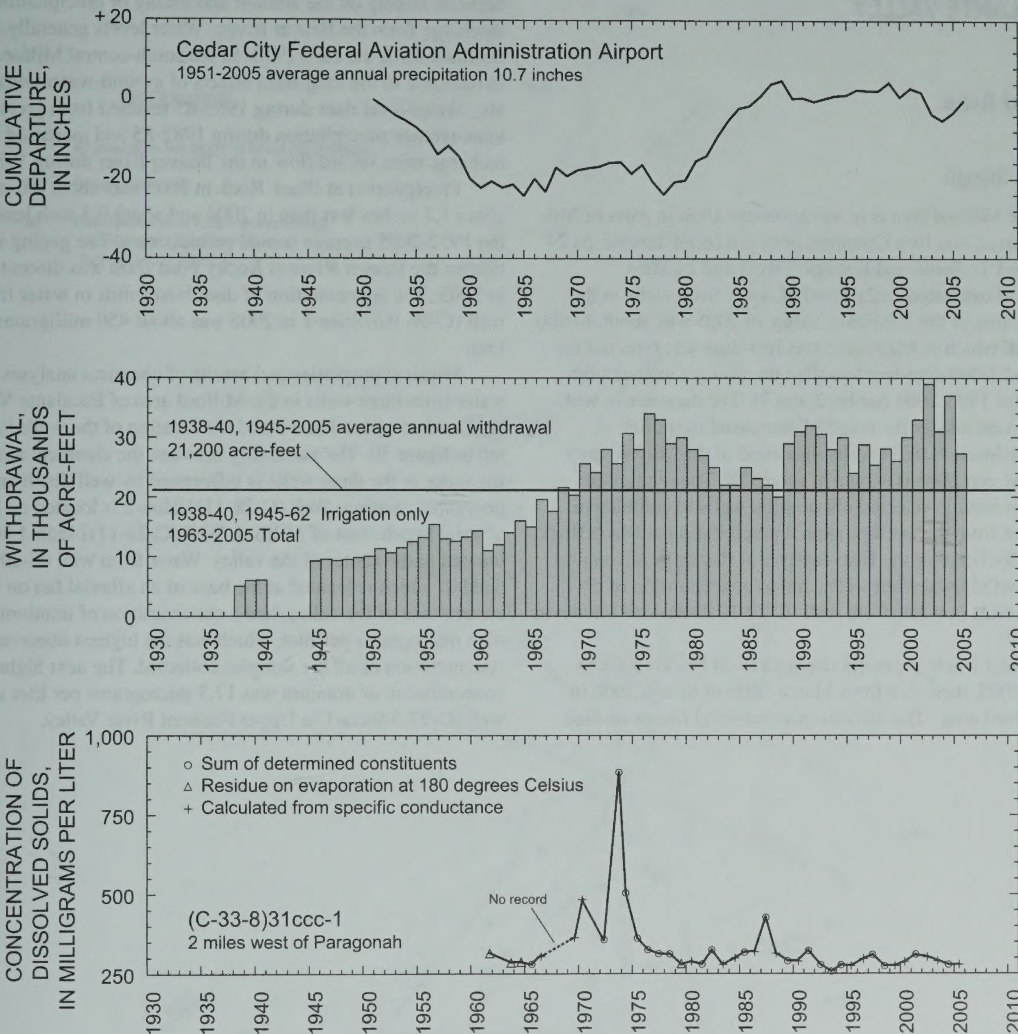


Figure 27. Relation of water level in selected wells in Parowan Valley to cumulative departure from average annual precipitation at Cedar City Federal Aviation Administration Airport, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-33-8)31ccc-1—Continued.

ESCALANTE VALLEY

Milford Area

By B.A. Slaugh

The Milford area is in southwestern Utah in parts of Millard, Beaver, and Iron Counties, between about Townships 24 South and 31 South and Ranges 9 West and 14 West.

Total estimated withdrawal of water from wells in the Milford area of the Escalante Valley in 2005 was about 40,000 acre-feet, which is 4,000 acre-feet less than was reported for 2004 and 7,000 acre-feet less than the average annual withdrawal for 1995-2004 (tables 2 and 3). The decrease in withdrawals was mostly the result of decreased irrigation.

The location of 34 wells measured in the Milford area during March 2006 is shown in figure 28. The relation of the water level in selected observation wells to cumulative departure from the average annual precipitation at Black Rock, annual discharge of the Beaver River at Rocky Ford Dam, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-29-10)18daa-1 is shown in figure 29.

Water levels generally declined from March 2001 to March 2005, then rose from March 2005 to March 2006 in the Milford area. The amount of water-level rise or decline depends largely on the amount and timing of precipitation and discharge from the Beaver River. Water levels generally have declined since the early1950s in the south-central Milford area in response to the long-term effects of ground-water withdrawals. Water-level rises during 1983-85 resulted from greater-than-average precipitation during 1982-85 and increased recharge from record flow in the Beaver River during 1983-84.

Precipitation at Black Rock in 2005 was about 8.6 inches, about 1.7 inches less than in 2004 and about 0.3 inch less than the 1952-2005 average annual precipitation. The gaging station on the Beaver River at Rocky Ford Dam was discontinued in 2003. The concentration of dissolved solids in water from well (C-29-10)18daa-1 in 2005 was about 450 milligrams per liter.

Physical properties and results of chemical analyses for water from three wells in the Milford area of Escalante Valley are listed in tables 4 and 5 and the location of the wells is plotted in figure 39. The variability between the chemical analyses for water in the three wells is influenced by well depth and geographic setting. Well (C-28-11)12dbc-2 is located on an alluvial bench west of Milford. Well (C-29-11)14cdb-1 is located in the center of the valley. Water from well (C-29-10)5cdd-2, which is located at the base of an alluvial fan on the eastern side of the valley, had a concentration of uranium of 42.5 micrograms per liter, which was the highest observed concentration of all the samples collected. The next highest concentration of uranium was 17.3 micrograms per liter at well (D-27-3)9aaa-1 in Upper Fremont River Valley.

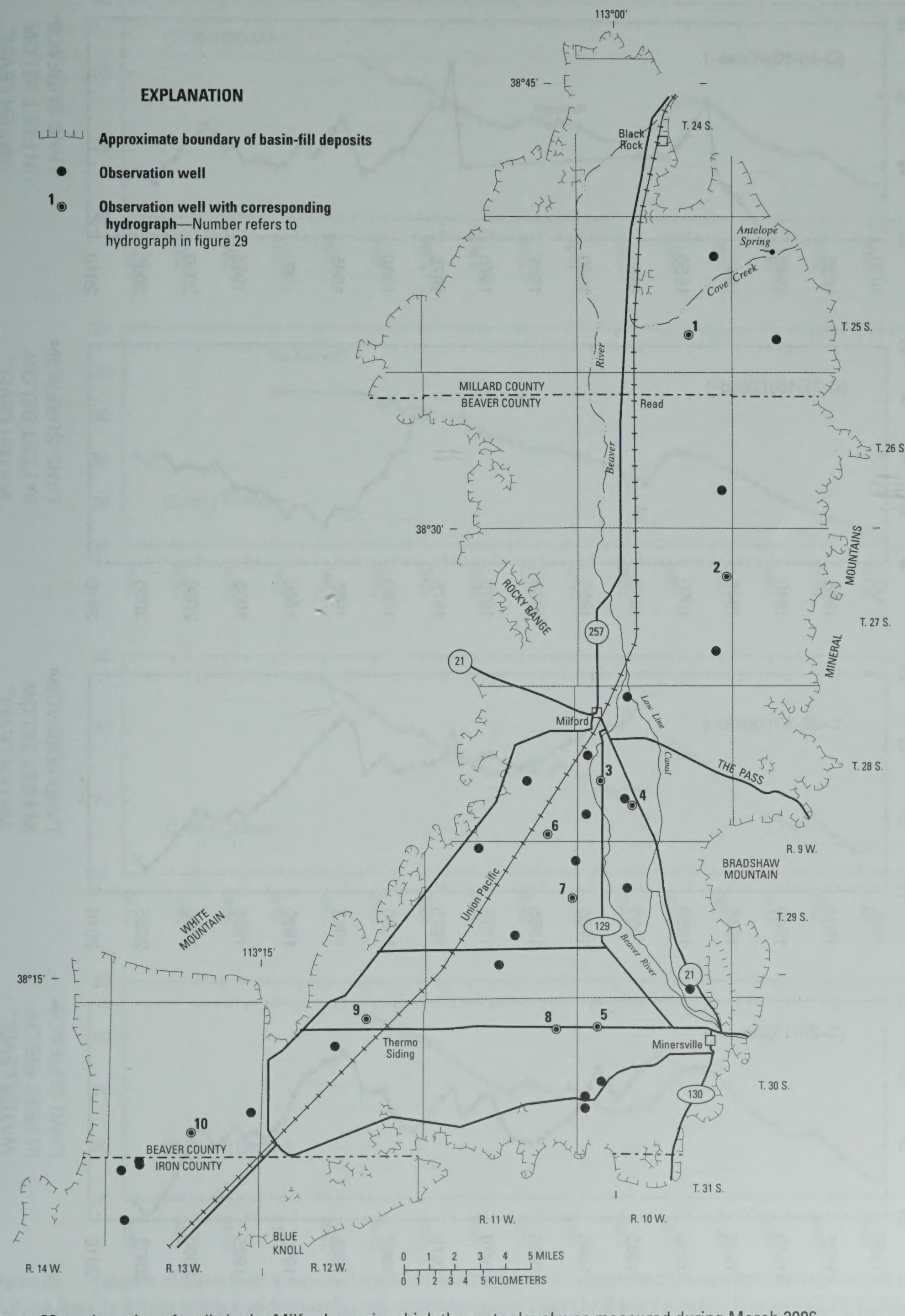


Figure 28. Location of wells in the Milford area in which the water level was measured during March 2006.

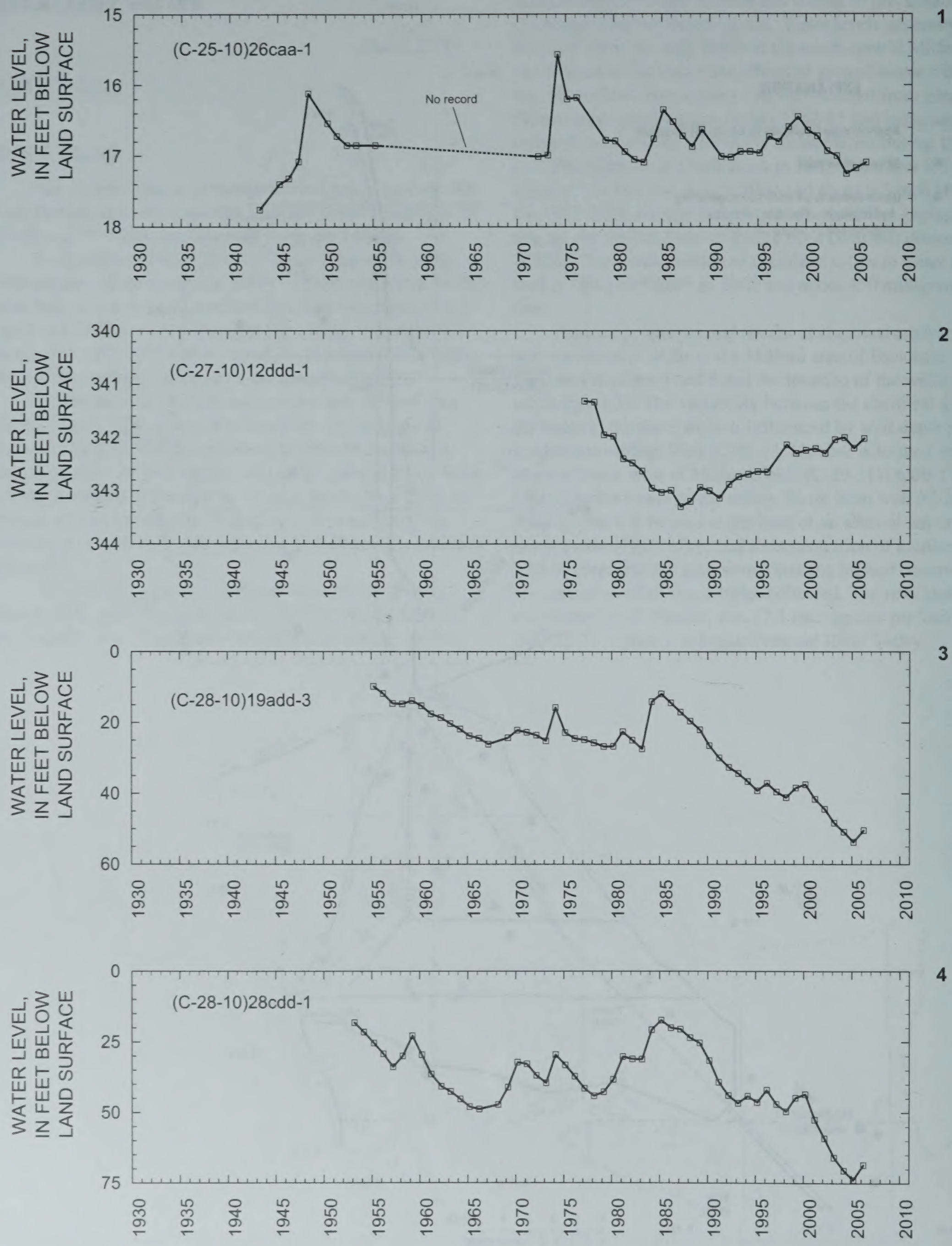


Figure 29. Relation of water level in selected wells in the Milford area to cumulative departure from average annual precipitation at Black Rock, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-29-10)18daa-1.

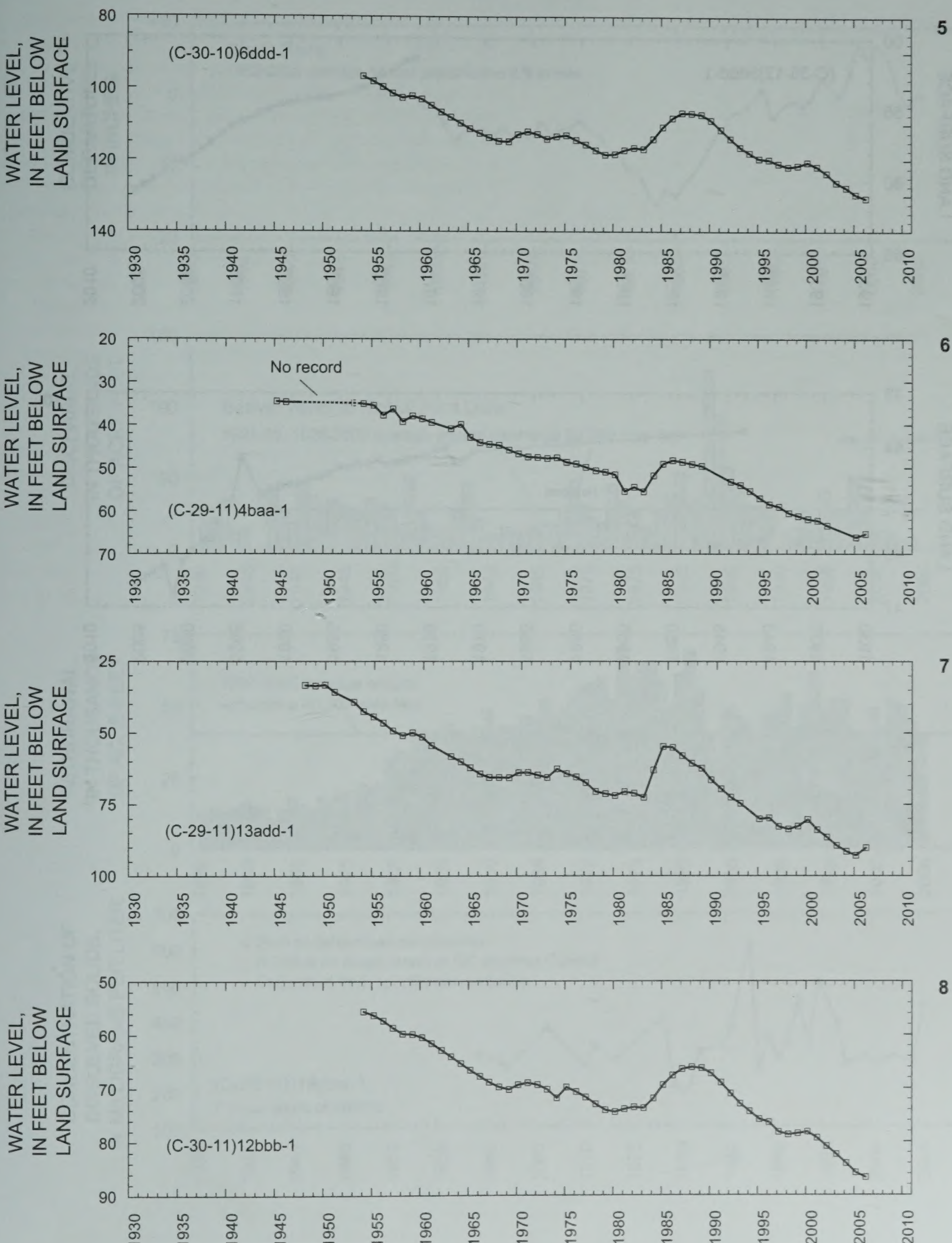
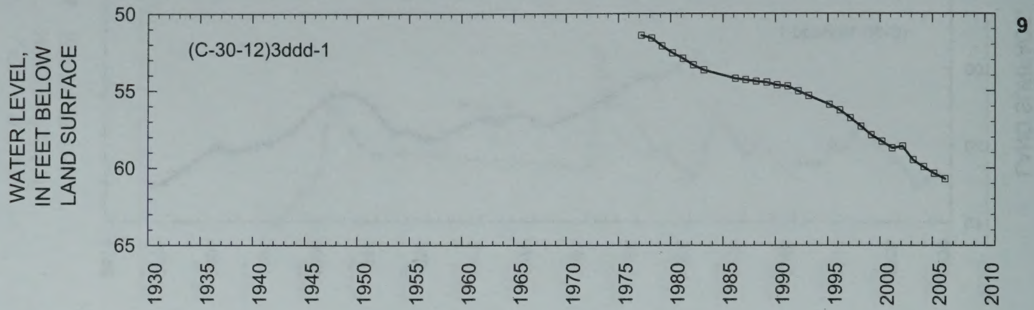


Figure 29. Relation of water level in selected wells in the Milford area to cumulative departure from average annual precipitation at Black Rock, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-29-10)18daa-1—Continued.



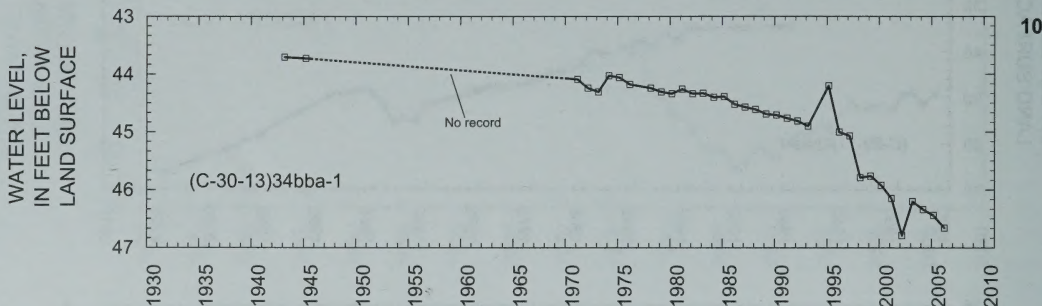


Figure 29. Relation of water level in selected wells in the Milford area to cumulative departure from average annual precipitation at Black Rock, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-29-10)18daa-1—Continued.

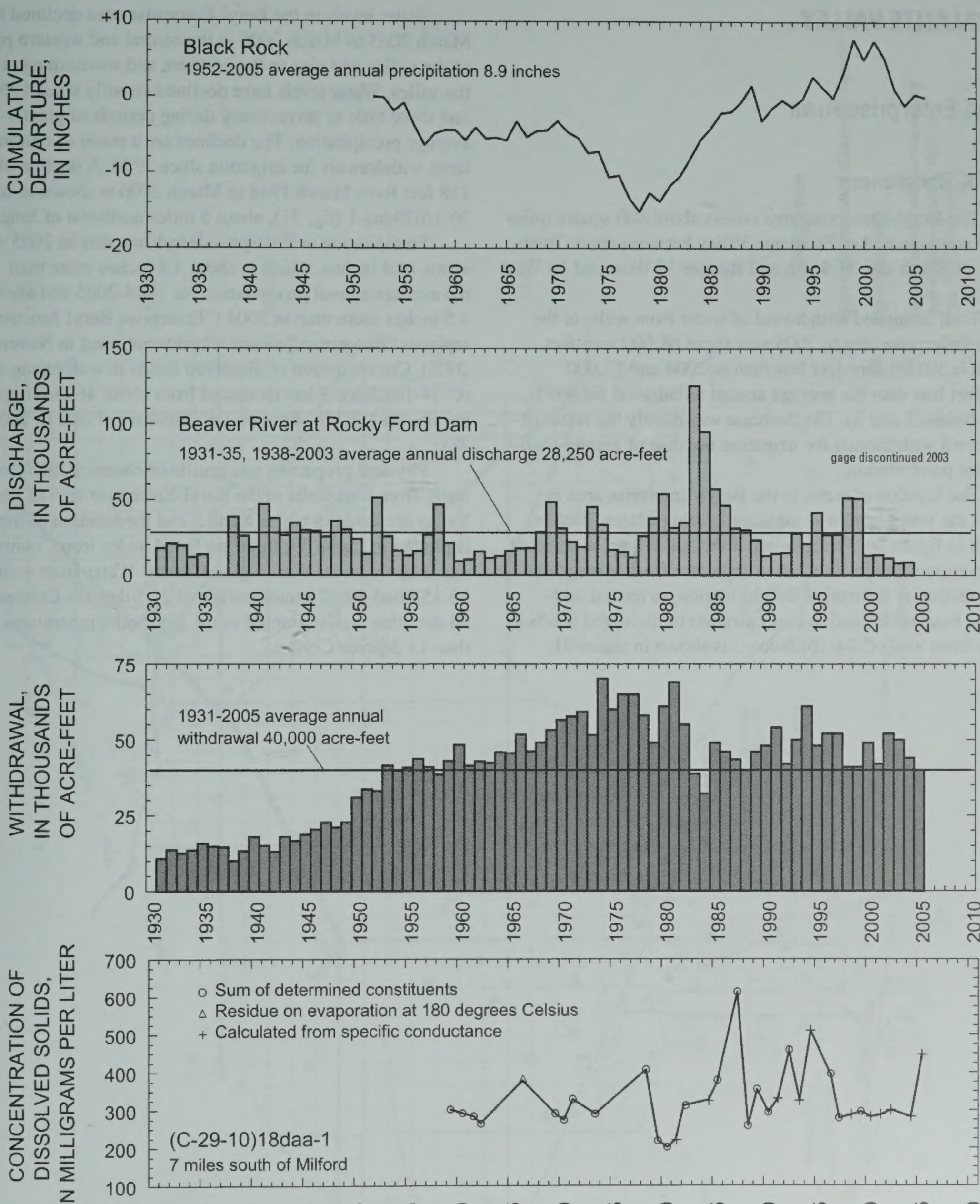


Figure 29. Relation of water level in selected wells in the Milford area to cumulative departure from average annual precipitation at Black Rock, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-29-10)18daa-1—Continued.

ESCALANTE VALLEY

Beryl-Enterprise Area

By H.K. Christiansen

The Beryl-Enterprise area covers about 800 square miles in the southern end of Escalante Valley between about Townships 31 South and 37 South and Ranges 12 West and 18 West (fig. 30).

Total estimated withdrawal of water from wells in the Beryl-Enterprise area in 2005 was about 68,000 acre-feet, which is 30,000 acre-feet less than in 2004 and 17,000 acre-feet less than the average annual withdrawal for 1995-2004 (tables 2 and 3). The decrease was mostly the result of decreased withdrawals for irrigation because of greater-than-average precipitation.

The location of wells in the Beryl-Enterprise area in which the water level was measured during March 2006 is shown in figure 30. The relation of the water level in selected observation wells to cumulative departure from average annual precipitation at Enterprise Beryl Junction, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-34-16)28dcc-2 is shown in figure 31.

Water levels in the Beryl-Enterprise area declined from March 2005 to March 2006 in the central and western parts of the valley and rose in the northern and southern parts of the valley. Water levels have declined steadily since 1950 and show little or no recovery during periods of greater-than-average precipitation. The declines are a result of continued large withdrawals for irrigation since 1950. A decline of about 118 feet from March 1948 to March 2006 is shown in well (C-36-16)29daa-1 (fig. 31), about 5 miles northeast of Enterprise.

Precipitation at Enterprise Beryl Junction in 2005 was about 14.4 inches, which is about 4.4 inches more than the average annual precipitation for 1948-2005 and about 4.5 inches more than in 2004 ("Enterprise Beryl Junction" replaces "Enterprise," which was discontinued in November 2005). Concentration of dissolved solids in water from well (C-34-16)28dcc-2 has increased from about 460 milligrams per liter in 1967 to about 660 milligrams per liter in 2005 (fig. 31).

Physical properties and results of chemical analyses for water from four wells in the Beryl-Enterprise area of Escalante Valley are listed in tables 4 and 5 and the location of the wells is plotted in figure 39; three are listed under Iron County and one is listed under Washington County. Water from well (C-36-15)4bad-3 had a temperature of 21.5 degrees Celsius, while all the other wells sampled in the area had temperatures of less than 13 degrees Celsius.

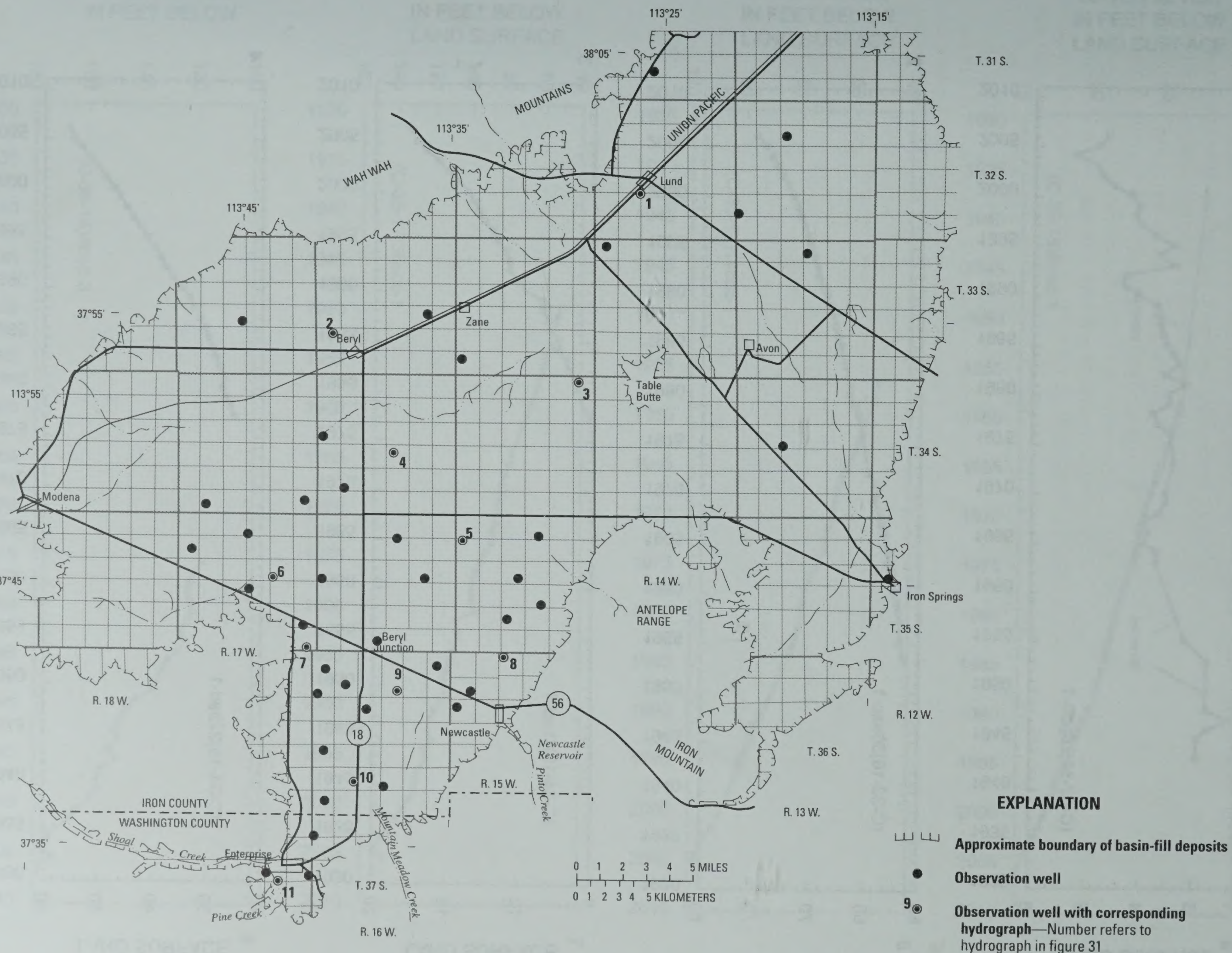


Figure 30. Location of wells in the Beryl-Enterprise area in which the water level was measured during March 2006.

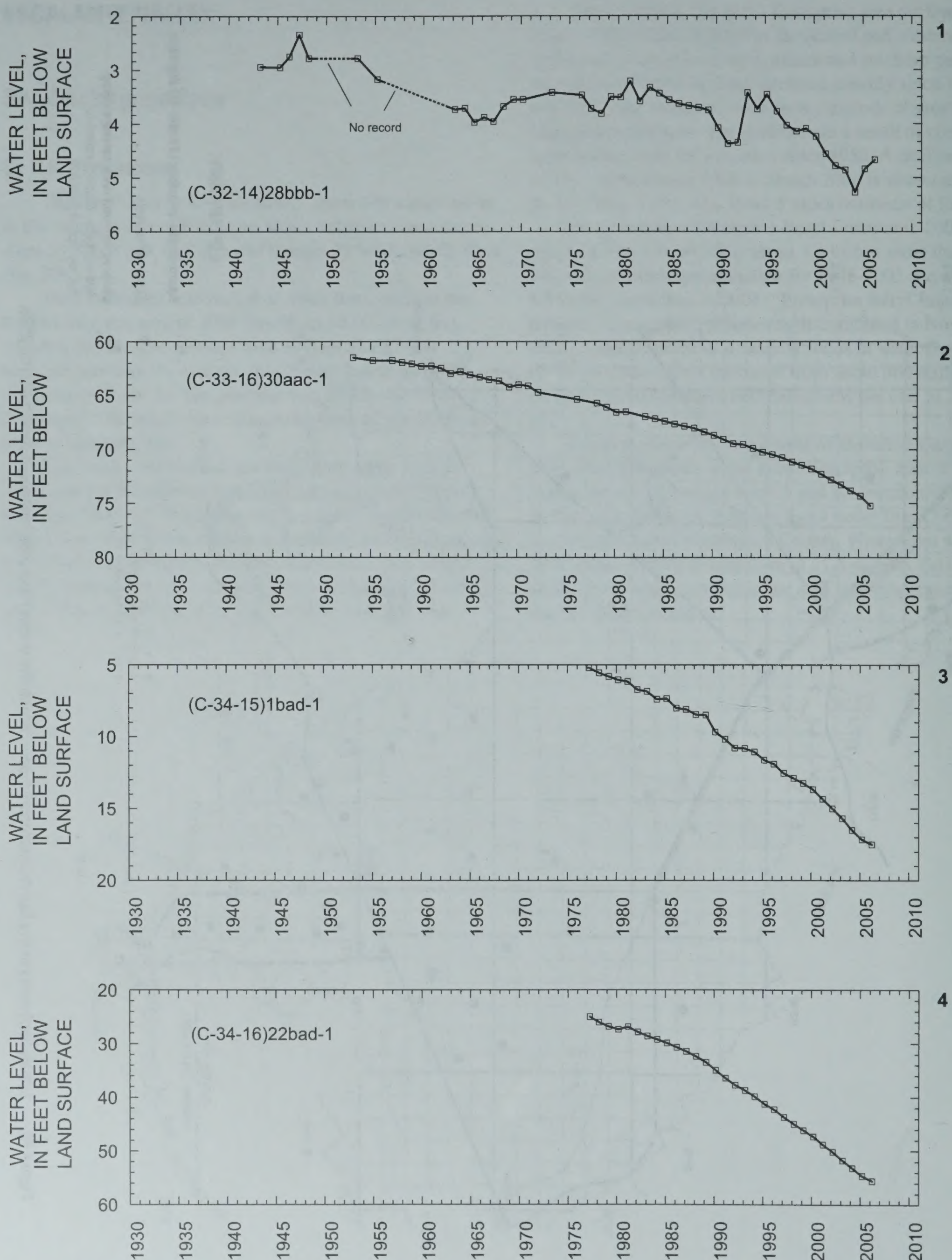


Figure 31. Relation of water level in selected wells in the Beryl-Enterprise area to cumulative departure from average annual precipitation at Enterprise Beryl Junction, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-34-16)28dcc-2.

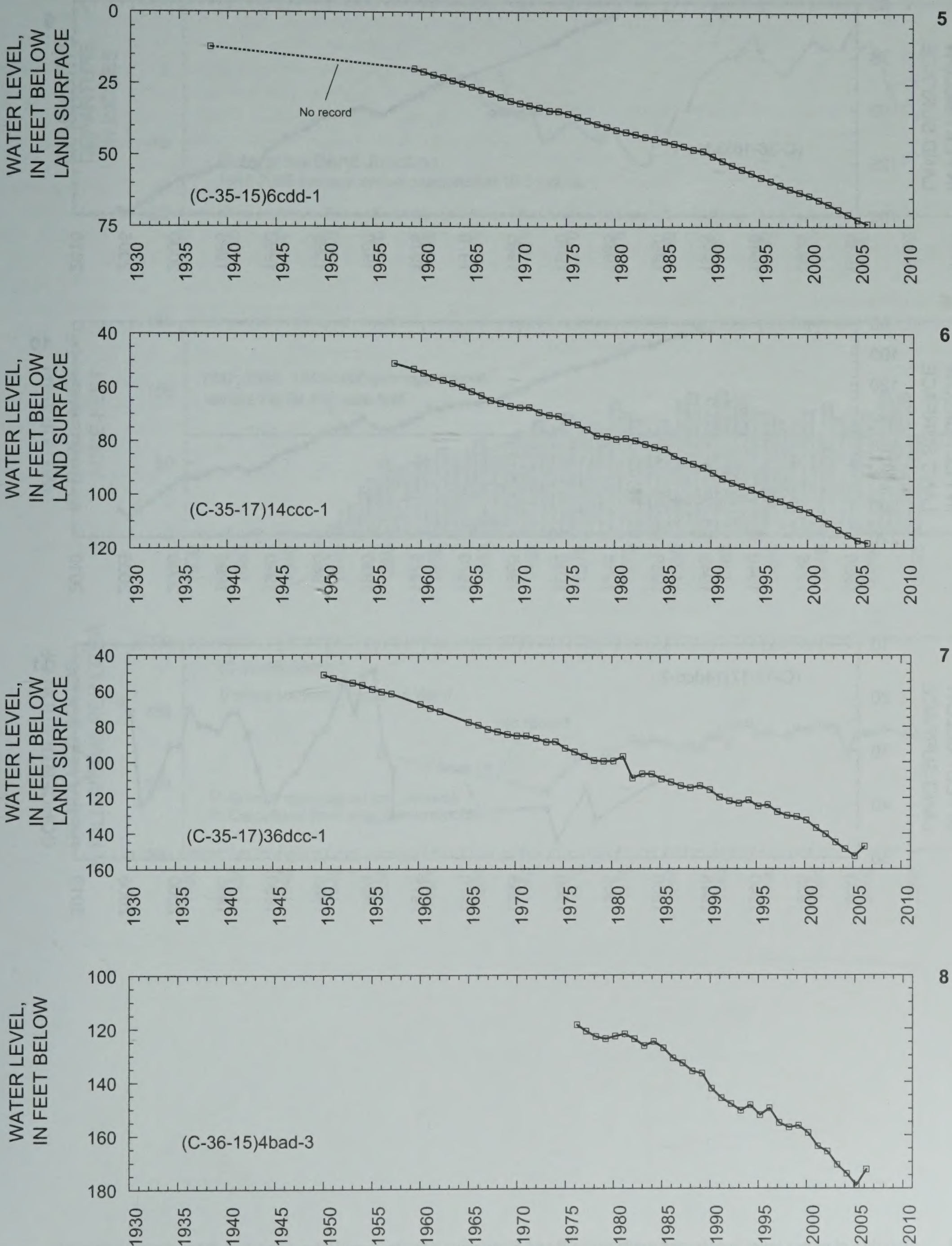


Figure 31. Relation of water level in selected wells in the Beryl-Enterprise area to cumulative departure from average annual precipitation at Enterprise Beryl Junction, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-34-16)28dcc-2—Continued.

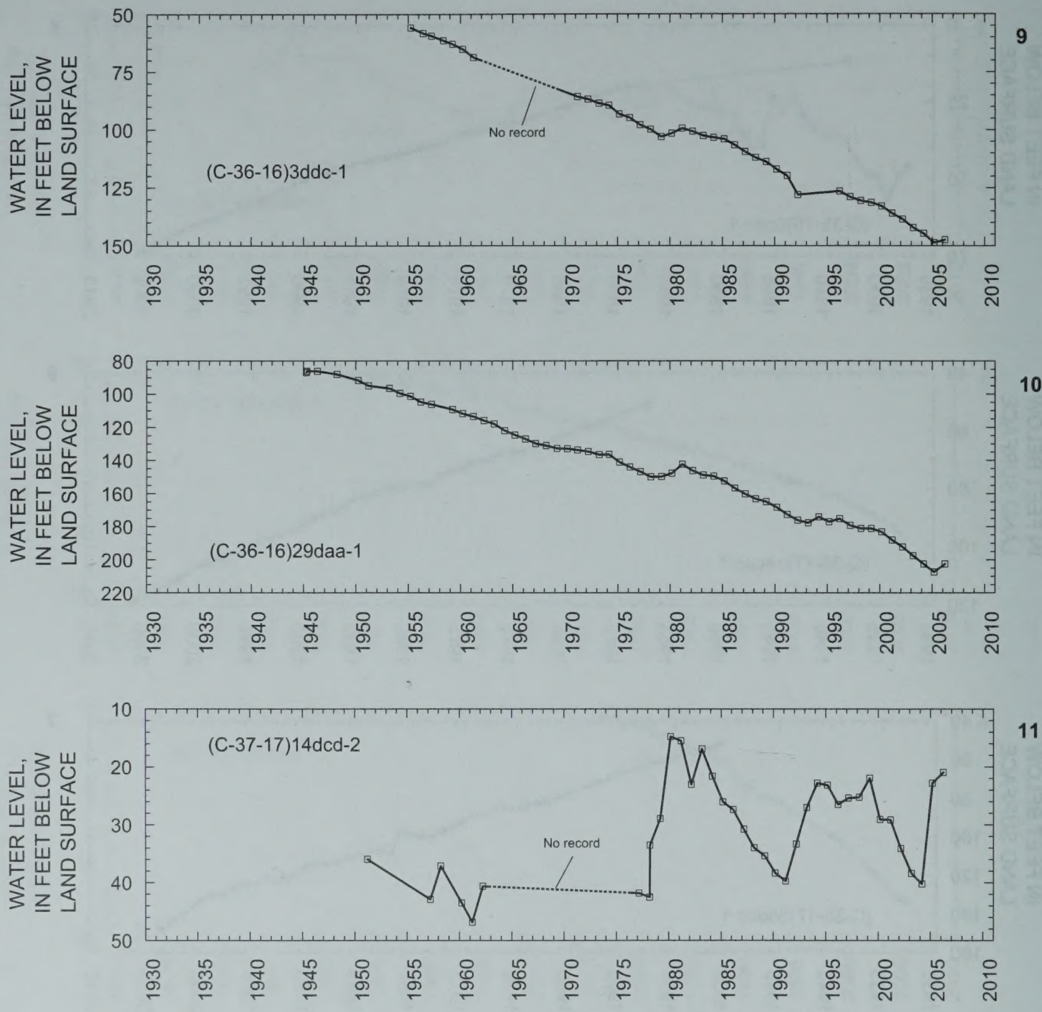


Figure 31. Relation of water level in selected wells in the Beryl-Enterprise area to cumulative departure from average annual precipitation at Enterprise Beryl Junction, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-34-16)28dcc-2 —Continued.

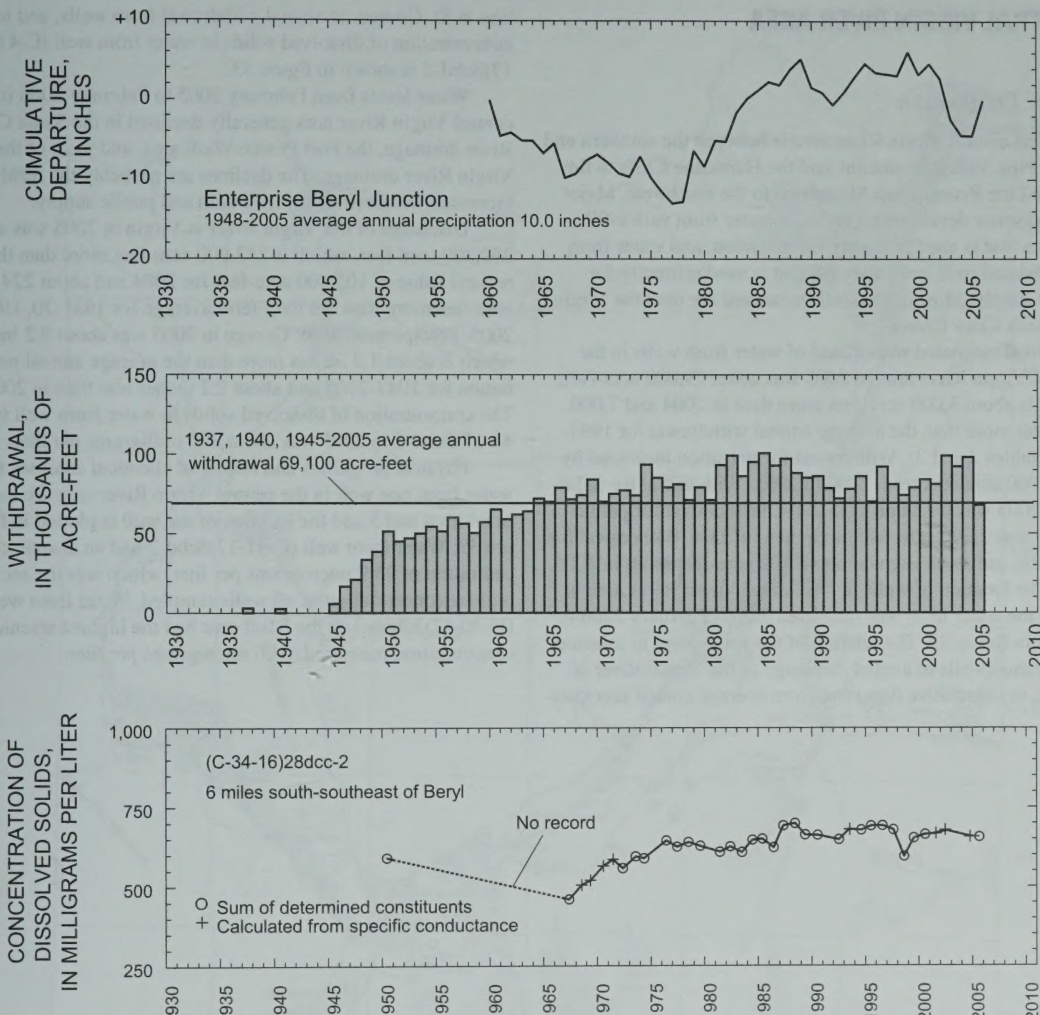


Figure 31. Relation of water level in selected wells in the Beryl-Enterprise area to cumulative departure from average annual precipitation at Enterprise Beryl Junction, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-34-16)28dcc-2— Continued.

CENTRAL VIRGIN RIVER AREA

By H.K. Christiansen

The central Virgin River area is between the southern end of the Pine Valley Mountains and the Hurricane Cliffs to the east and the Beaver Dam Mountains to the southwest. Major ground-water development includes water from valley-fill aquifers that is used primarily for irrigation, and water from consolidated rock and valley fill that is used primarily for public supply. Most of the wells measured are near the Virgin and Santa Clara Rivers.

Total estimated withdrawal of water from wells in the central Virgin River area in 2005 was about 29,000 acre-feet, which is about 3,000 acre-feet more than in 2004 and 7,000 acre-feet more than the average annual withdrawal for 1995-2004 (tables 2 and 3). Withdrawal for irrigation increased by about 900 acre-feet from 2004 to 2005. Withdrawal for industry in 2005 was the same as in 2004. Withdrawal for public supply was 2,200 acre-feet more than in 2004. Withdrawal for domestic and stock use was about 100 acre-feet more in 2005.

The location of wells in the central Virgin River area in which the water level was measured during February 2006 is shown in figure 32. The relation of the water level in selected observation wells to annual discharge of the Virgin River at Virgin, to cumulative departure from average annual precipitation at St. George, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-41-17)8cbd-2 is shown in figure 33.

Water levels from February 2005 to February 2006 in the central Virgin River area generally declined in the Santa Clara River drainage, the Fort Pearce Wash area, and most of the Virgin River drainage. The declines are probably the result of increased withdrawals for irrigation and public supply.

Discharge of the Virgin River at Virgin in 2005 was about 359,300 acre-feet, which is 253,900 acre-feet more than the revised value of 105,400 acre-feet for 2004 and about 224,400 acre-feet more than the long-term average for 1931-70, 1979-2005. Precipitation at St. George in 2005 was about 9.2 inches, which is about 1.2 inches more than the average annual precipitation for 1947-2005 and about 2.1 inches less than in 2004. The concentration of dissolved solids in water from well (C-41-17)8cbd-2 in 2005 was about 270 milligrams per liter.

Physical properties and results of chemical analyses for water from one well in the central Virgin River area are listed in tables 4 and 5 and the location of the well is plotted in figure 39. Water from well (C-41-17)8cbd-2 had an arsenic concentration of 25.9 micrograms per liter, which was the second highest concentration of all wells sampled. Water from well (D-40-22)30bbb-1 in the Bluff area had the highest arsenic concentration measured, 64.6 micrograms per liter.

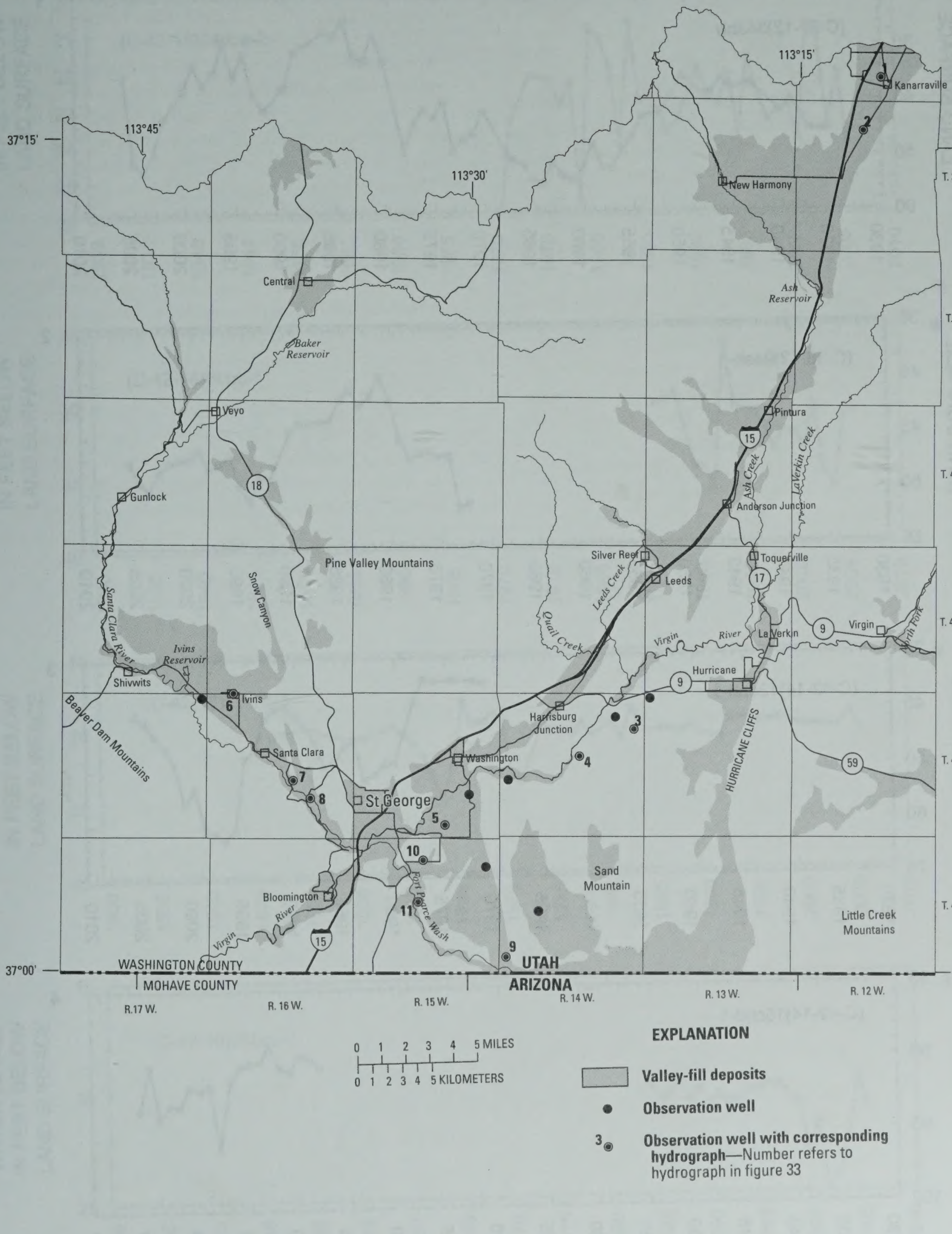


Figure 32. Location of wells in the central Virgin River area in which the water level was measured during February 2006.

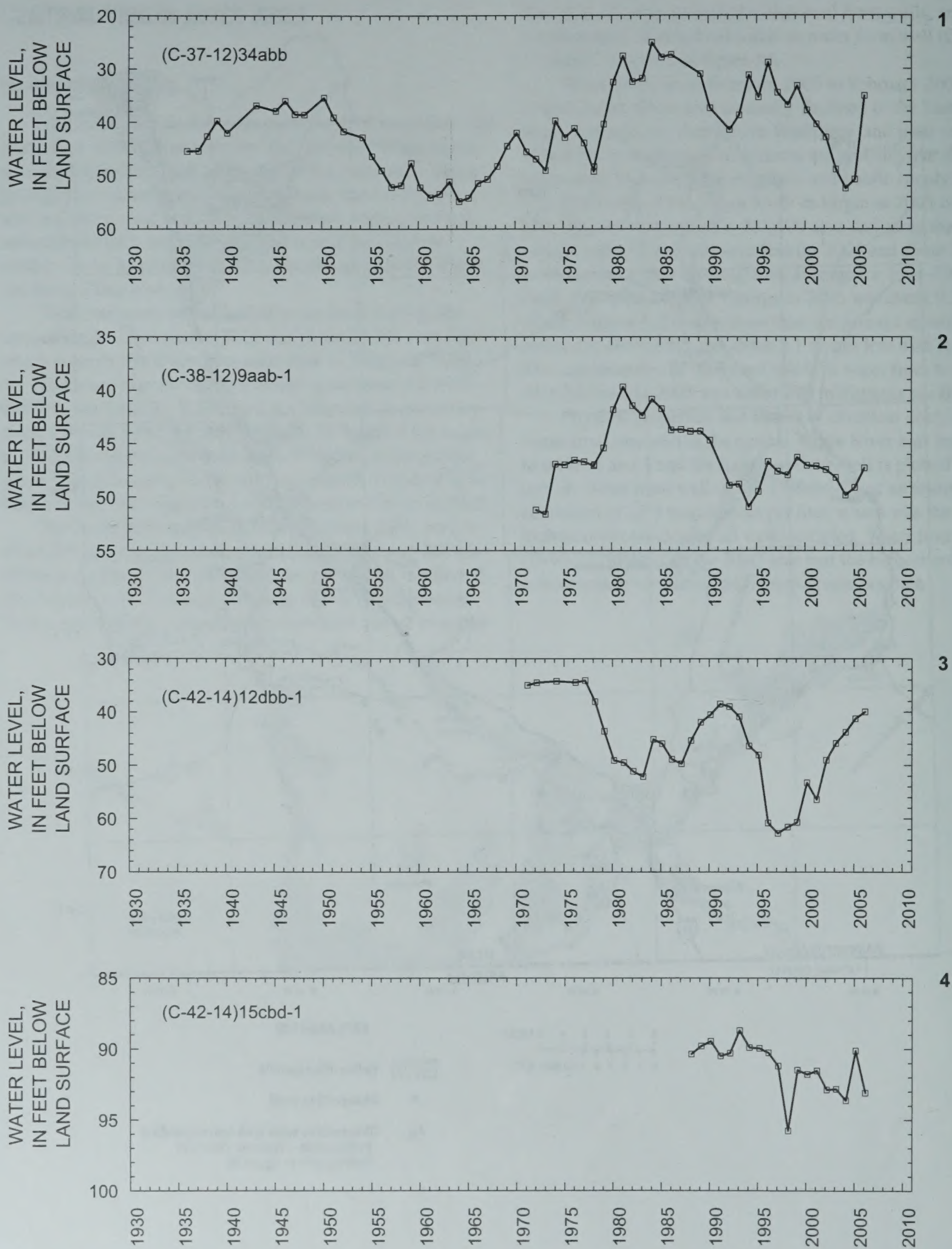


Figure 33. Relation of water level in selected wells in the central Virgin River area to annual discharge of the Virgin River at Virgin, to cumulative departure from average annual precipitation at St. George, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-41-17)8cbd-2.

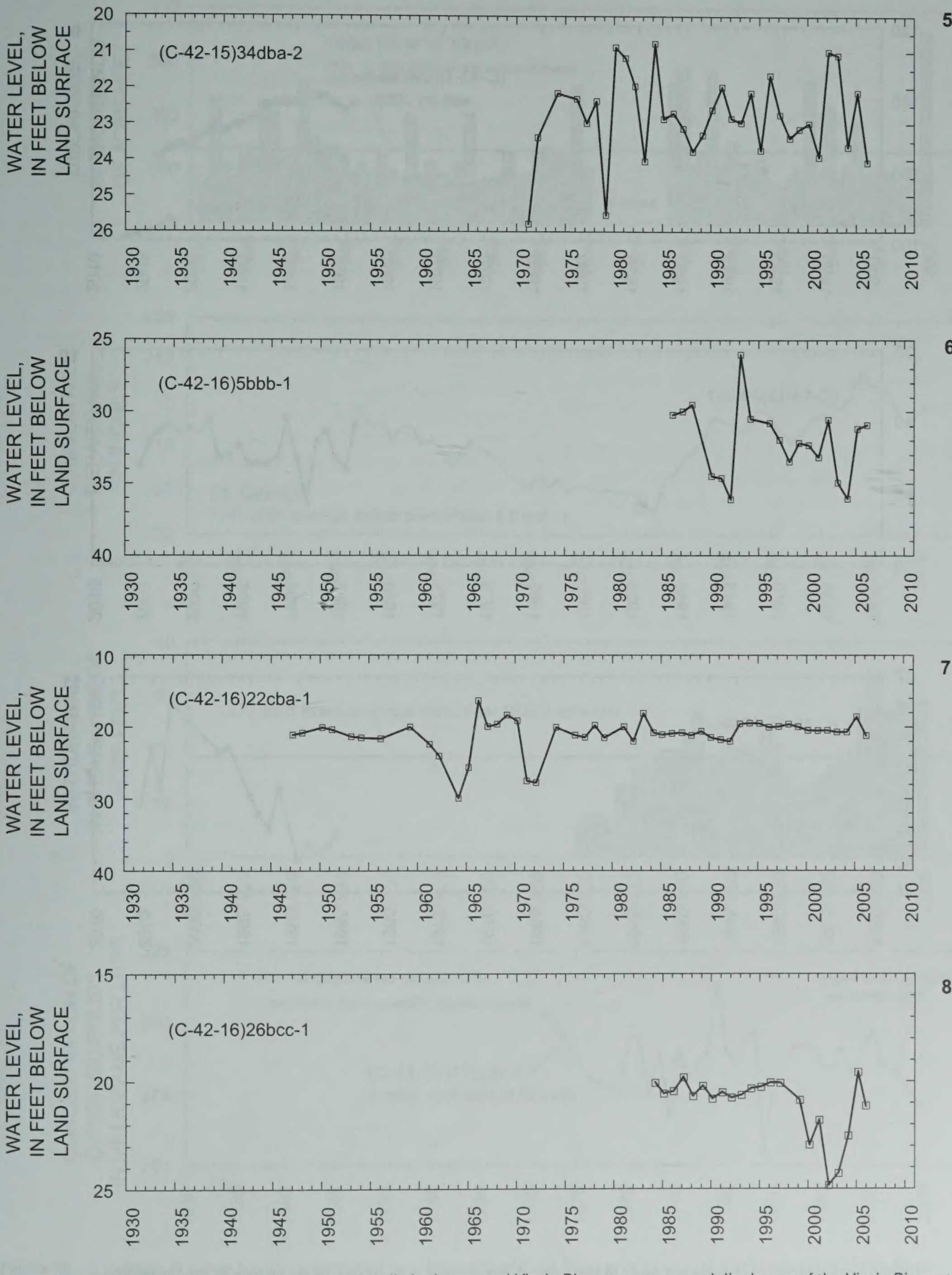


Figure 33. Relation of water level in selected wells in the central Virgin River area to annual discharge of the Virgin River at Virgin, to cumulative departure from average annual precipitation at St. George, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-41-17)8cbd-2—Continued.

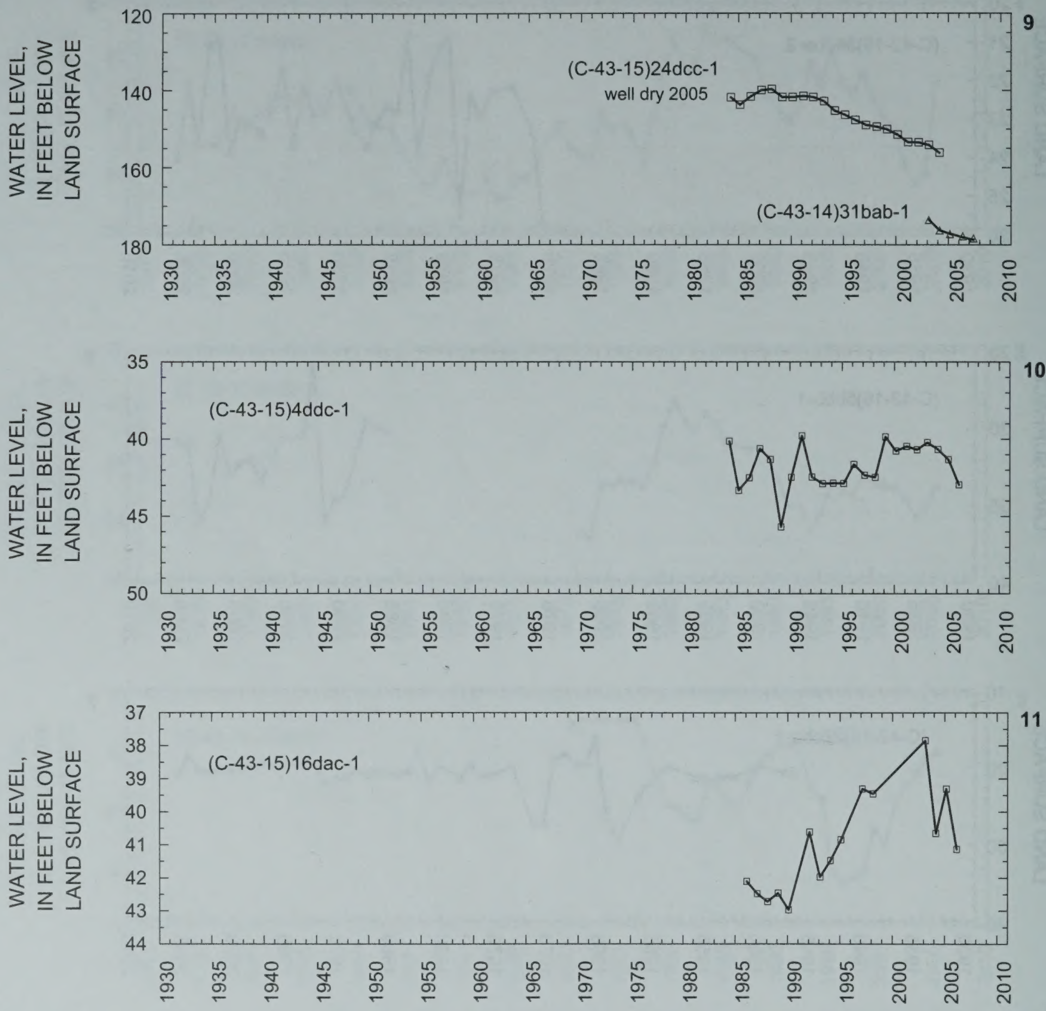


Figure 33. Relation of water level in selected wells in the central Virgin River area to annual discharge of the Virgin River at Virgin, to cumulative departure from average annual precipitation at St. George, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-41-17)8cbd-2—Continued.

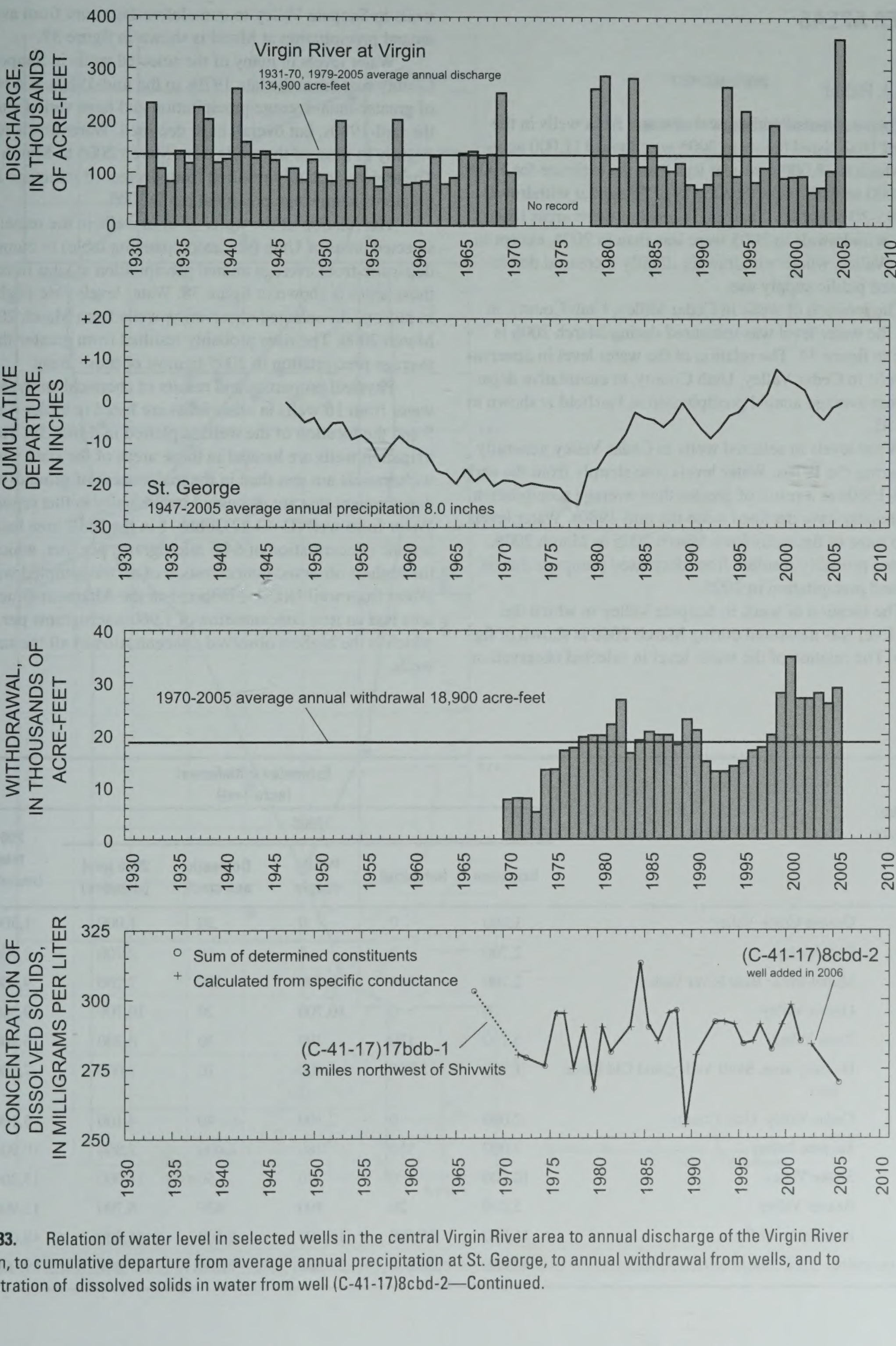


Figure 33. Relation of water level in selected wells in the central Virgin River area to annual discharge of the Virgin River at Virgin, to cumulative departure from average annual precipitation at St. George, to annual withdrawal from wells, and to concentration of dissolved solids in water from well (C-41-17)8cbd-2—Continued.

OTHER AREAS

By M.J. Fisher

Total estimated withdrawal of water from wells in the areas of Utah listed below in 2005 was about 111,000 acre-feet, which is 18,000 acre-feet less than the estimate for 2004 and 5,000 acre-feet less than the average annual withdrawal for 1995-2004 (tables 2 and 3). In most of these areas listed below, withdrawals in 2005 were less than in 2004, except in Ogden Valley, where withdrawals slightly increased due to increased public supply use.

The location of wells in Cedar Valley, Utah County, in which the water level was measured during March 2006 is shown in figure 34. The relation of the water level in observation wells in Cedar Valley, Utah County, to cumulative departure from average annual precipitation at Fairfield is shown in figure 35.

Water levels in selected wells in Cedar Valley generally rose during the 1970s. Water levels rose sharply from the early to mid-1980s as a result of greater-than-average precipitation, but generally have declined since the mid-1980s. Water levels rose in most of the wells from March 2005 to March 2006. The rises probably resulted from decreased pumpage due to increased precipitation in 2005.

The location of wells in Sanpete Valley in which the water level was measured during March 2006 is shown in figure 36. The relation of the water level in selected observation wells in Sanpete Valley to cumulative departure from average annual precipitation at Manti is shown in figure 37.

Water levels in many of the selected wells in Sanpete County rose from the late 1970s to the mid-1980s as a result of greater-than-average precipitation and have varied since the mid-1980s, but overall have declined. Water levels rose slightly in most of the wells from March 2005 to March 2006. These rises probably resulted from decreased pumpage and greater-than-average precipitation in 2005.

The relation of the water level in wells in the remaining selected areas of Utah (see accompanying table) to cumulative departure from average annual precipitation at sites in or near those areas is shown in figure 38. Water levels rose slightly in most of the selected observation wells from March 2005 to March 2006. The rises probably resulted from greater-than-average precipitation in 2005 in most of those areas.

Physical properties and results of chemical analyses for water from 16 wells in other areas are listed in tables 4 and 5 and the location of the wells is plotted in figure 39. These irrigation wells are located in those areas of the state where withdrawals are less than in the major areas of ground-water development that are discussed individually in this report. Water from well (D-40-22)30bbb-1 in the Bluff area had an arsenic concentration of 64.6 micrograms per liter, which is the highest observed concentration of all the sampled wells. Water from well U(C-1-1)33bcc-1 in the Altamont-Bluebell area had an iron concentration of 1,960 micrograms per liter, which is the highest observed concentration of all the sampled wells.

Number in figure 1	Area	Estimated withdrawal (acre-feet) 2005 Irrigation	Industrial	Public supply	Domestic and stock	2005 total (rounded)	2004 total (rounded)
1	Grouse Creek Valley	1,000	0	0	20	1,000	1,300
2	Park Valley	2,700	0	0	10	2,700	2,900
4	Malad-lower Bear River Valley	2,700	640	3,700	200	7,200	9,400
8	Ogden Valley	0	0	10,700	20	10,700	9,500
13	Rush Valley	5,700	170	290	30	6,200	6,400
14	Dugway area, Skull Valley, and Old River Bed	1,900	3,700	1,400	10	7,000	7,800
15	Cedar Valley, Utah County	2,000	0	2,100	40	4,100	5,100
20	Sanpete Valley	3,000	550	280	4,000	7,800	10,900
25	Snake Valley	10,900	0	70	50	11,000	13,200
27	Beaver Valley	5,800	20	490	430	6,700	13,900
	Remainder of State	11,900	15,500	16,300	2,500	46,200	48,600
Total (rounded)		47,600	20,600	35,300	7,300	111,000	129,000

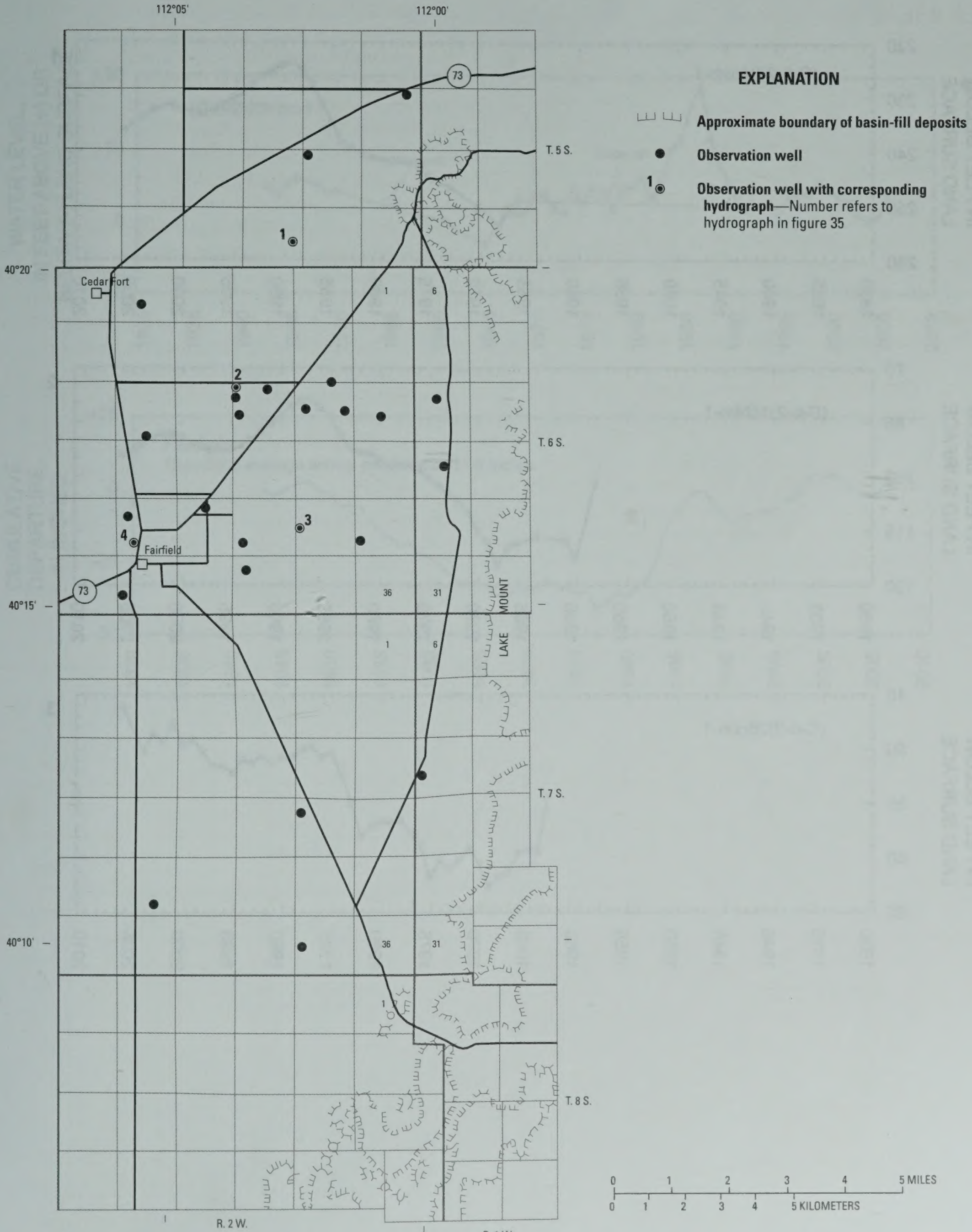


Figure 34. Location of wells in Cedar Valley, Utah County, in which the water level was measured during March 2006.

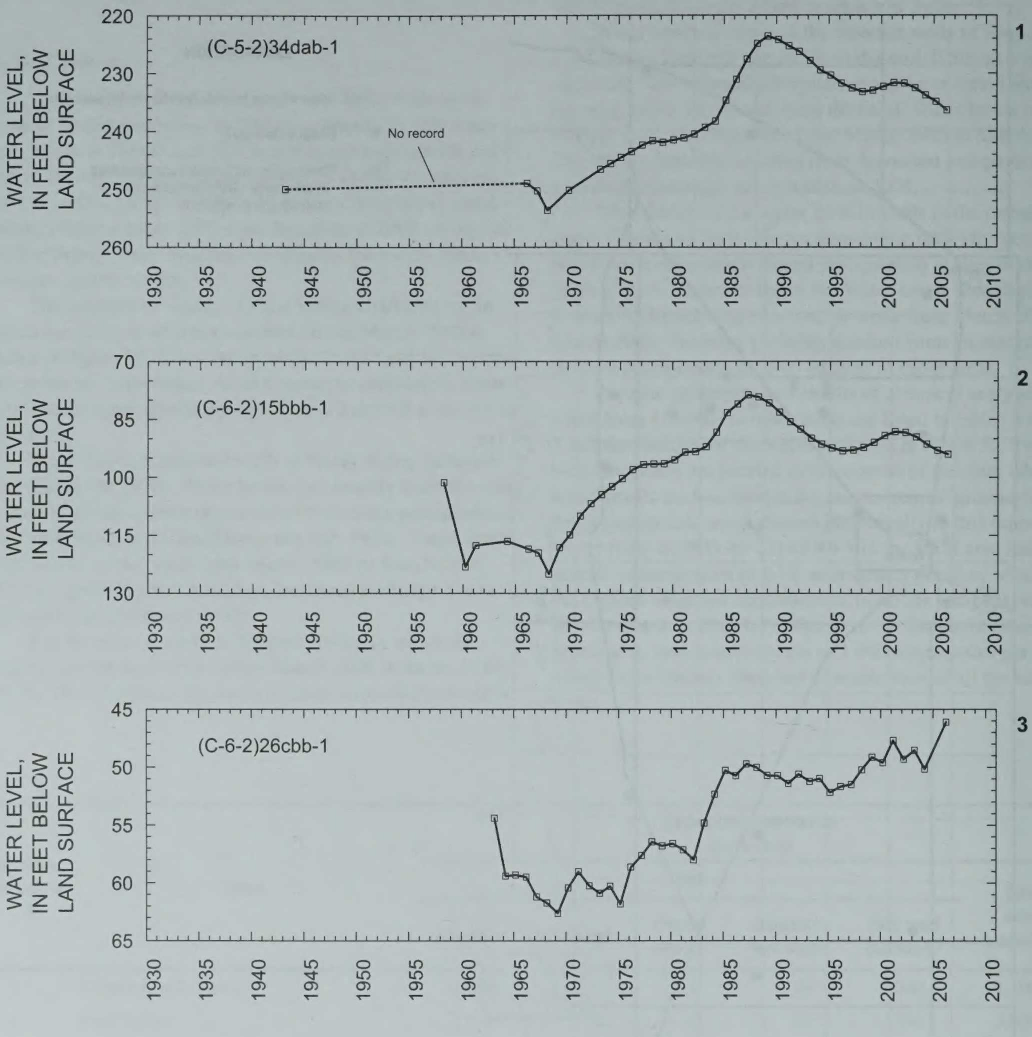


Figure 35. Relation of water level in selected wells in Cedar Valley, Utah County, to cumulative departure from average annual precipitation at Fairfield.

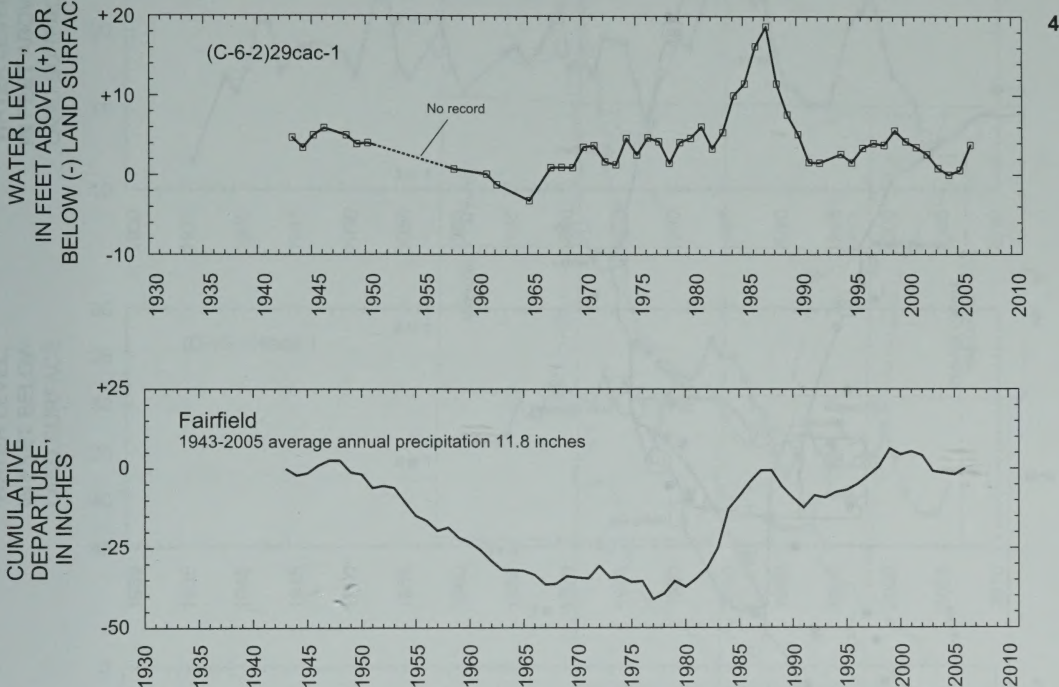


Figure 35. Relation of water level in selected wells in Cedar Valley, Utah County, to cumulative departure from average annual precipitation at Fairfield—Continued.

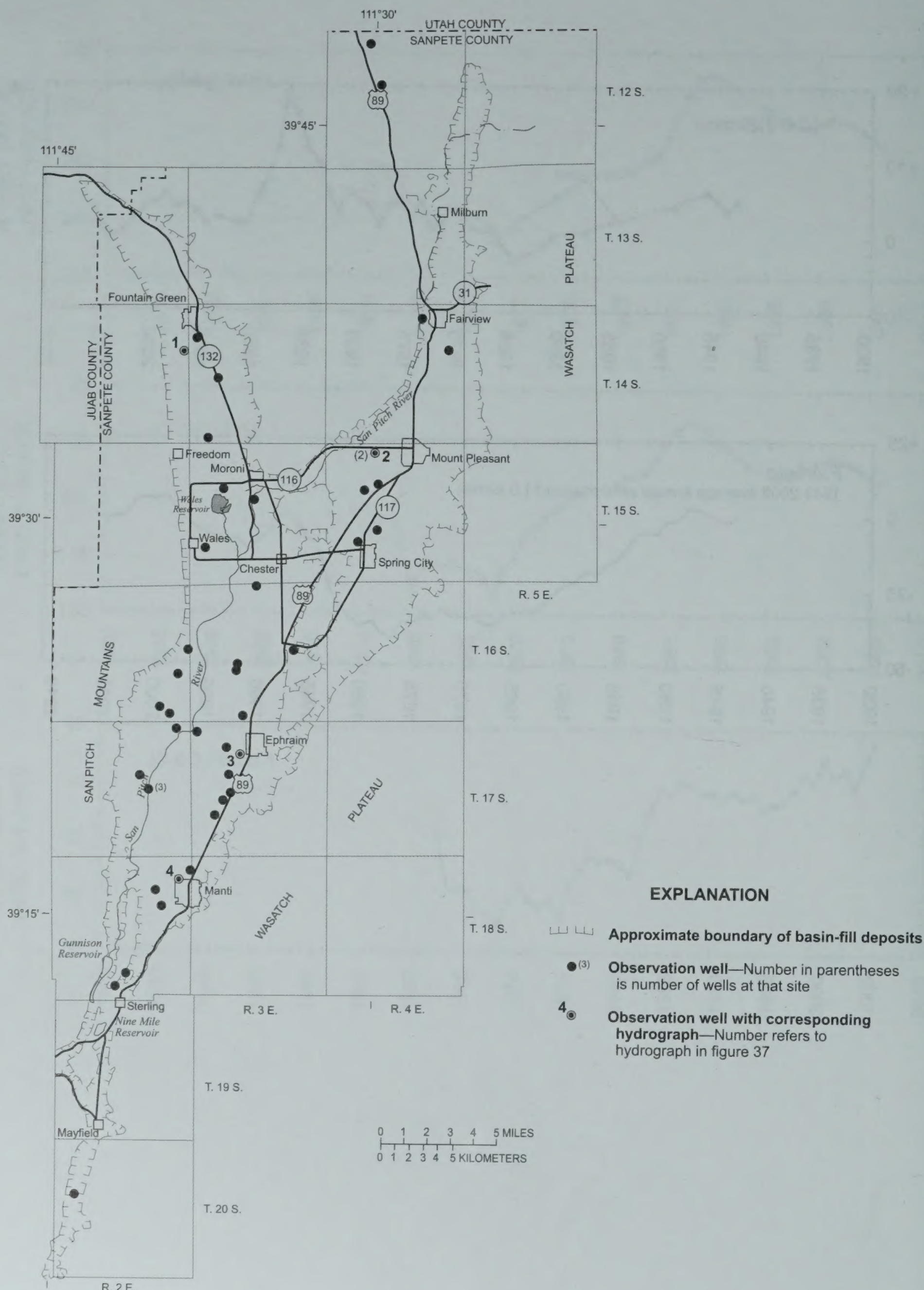


Figure 36. Location of wells in Sanpete Valley in which the water level was measured during March 2006.

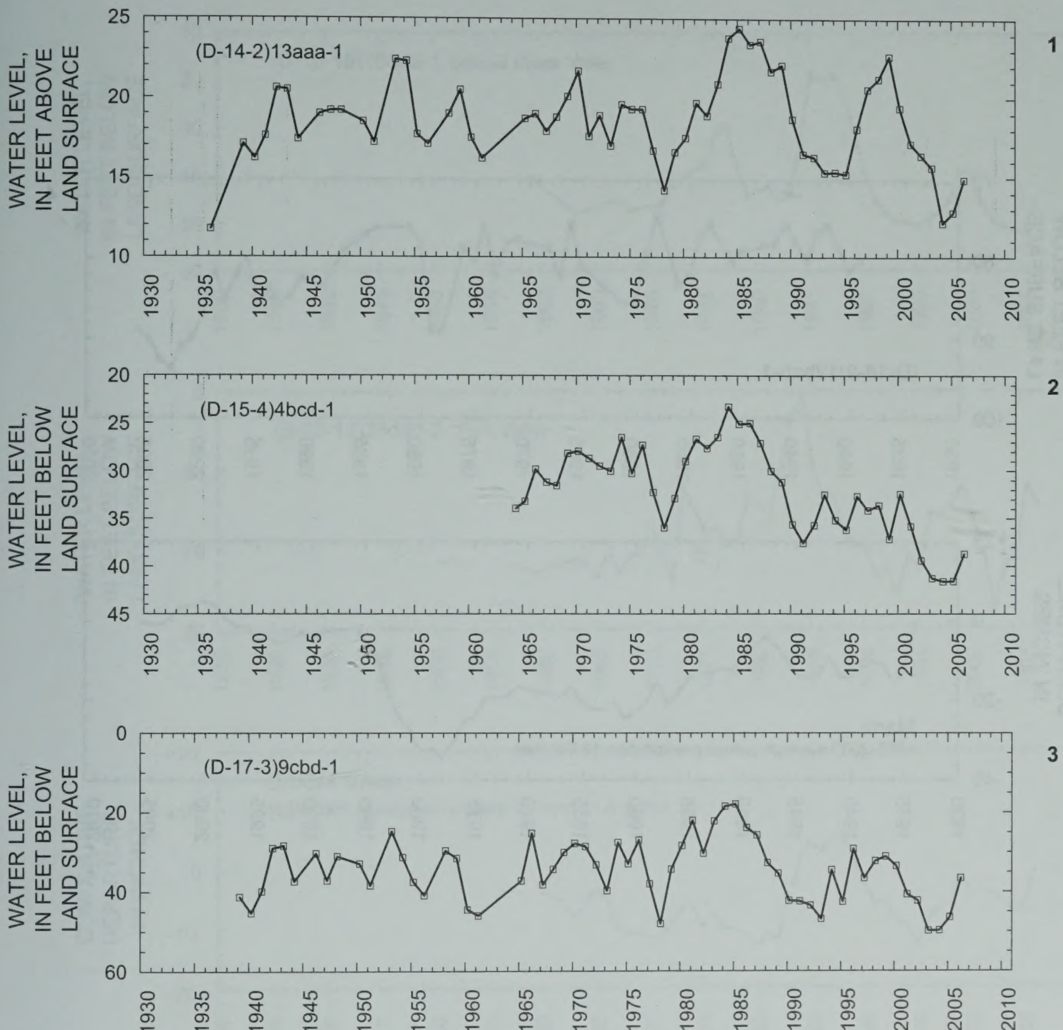


Figure 37. Relation of water level in selected wells in Sanpete Valley to cumulative departure from average annual precipitation at Manti.

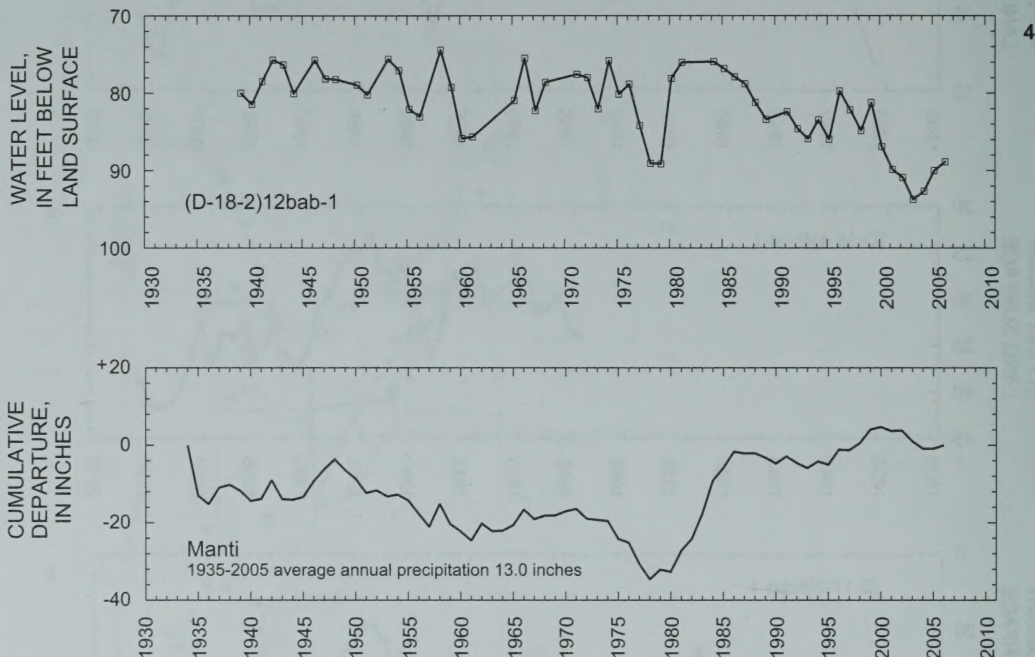


Figure 37. Relation of water level in selected wells in Sanpete Valley to cumulative departure from average annual precipitation at Manti—Continued.

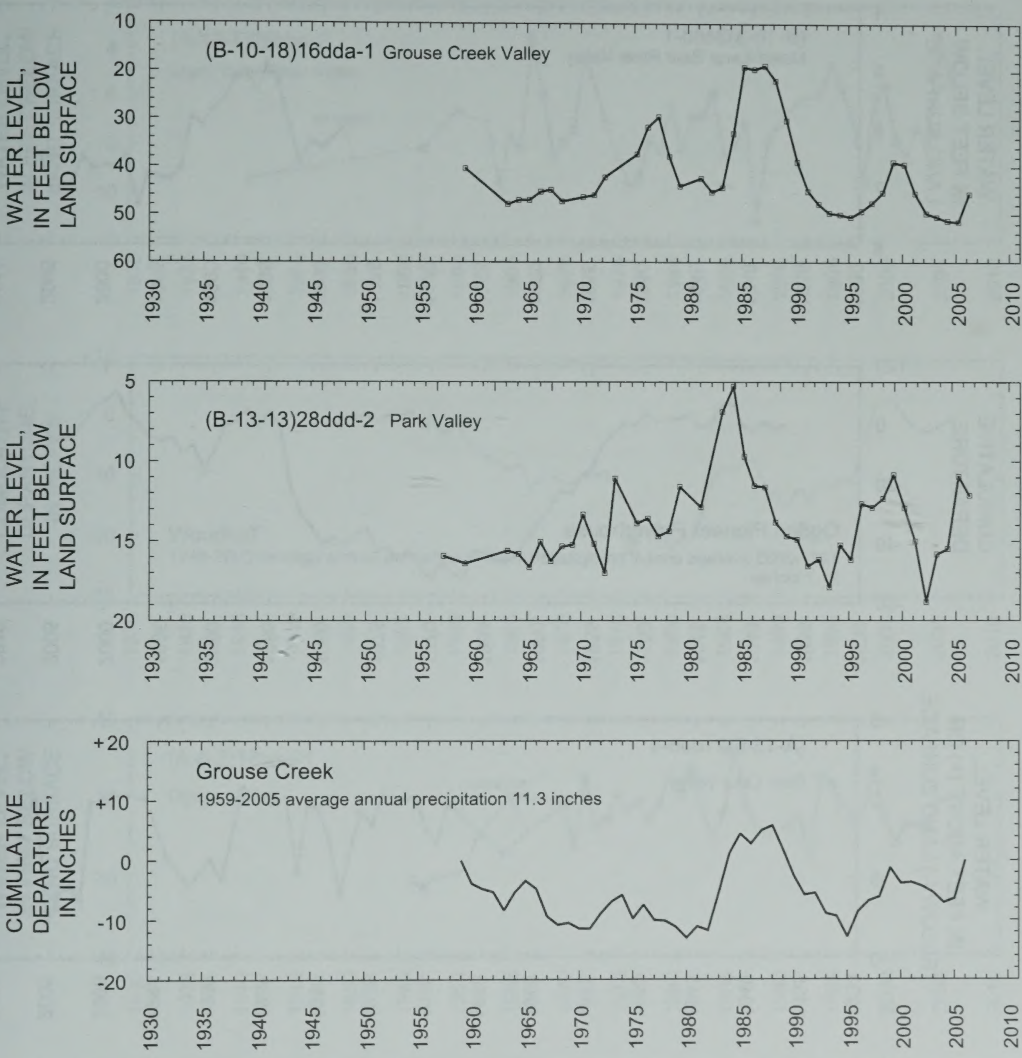


Figure 38. Relation of water level in wells in selected areas of Utah to cumulative departure from average annual precipitation at sites in or near those areas.

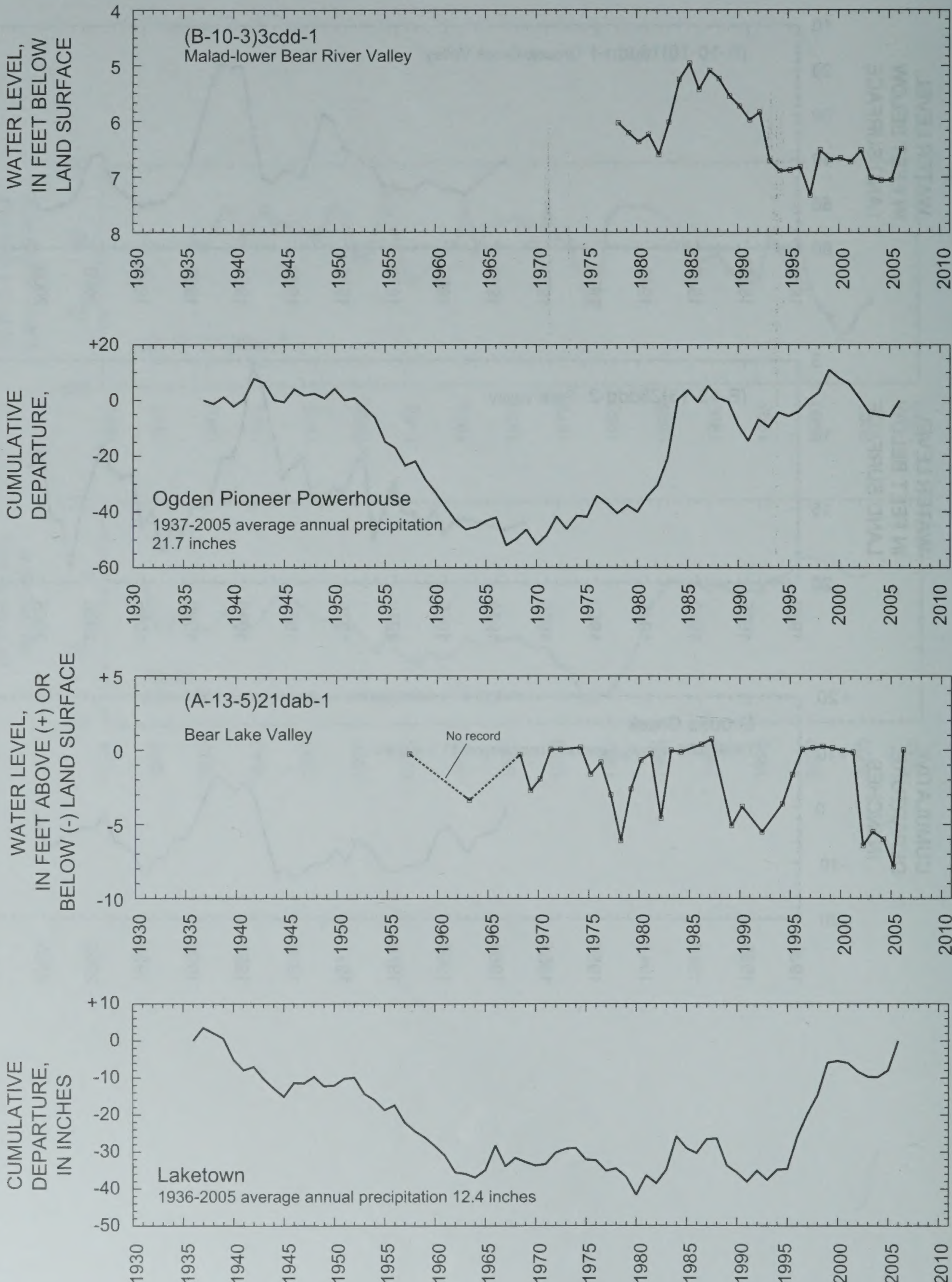


Figure 38. Relation of water level in wells in selected areas of Utah to cumulative departure from average annual precipitation at sites in or near those areas—Continued.

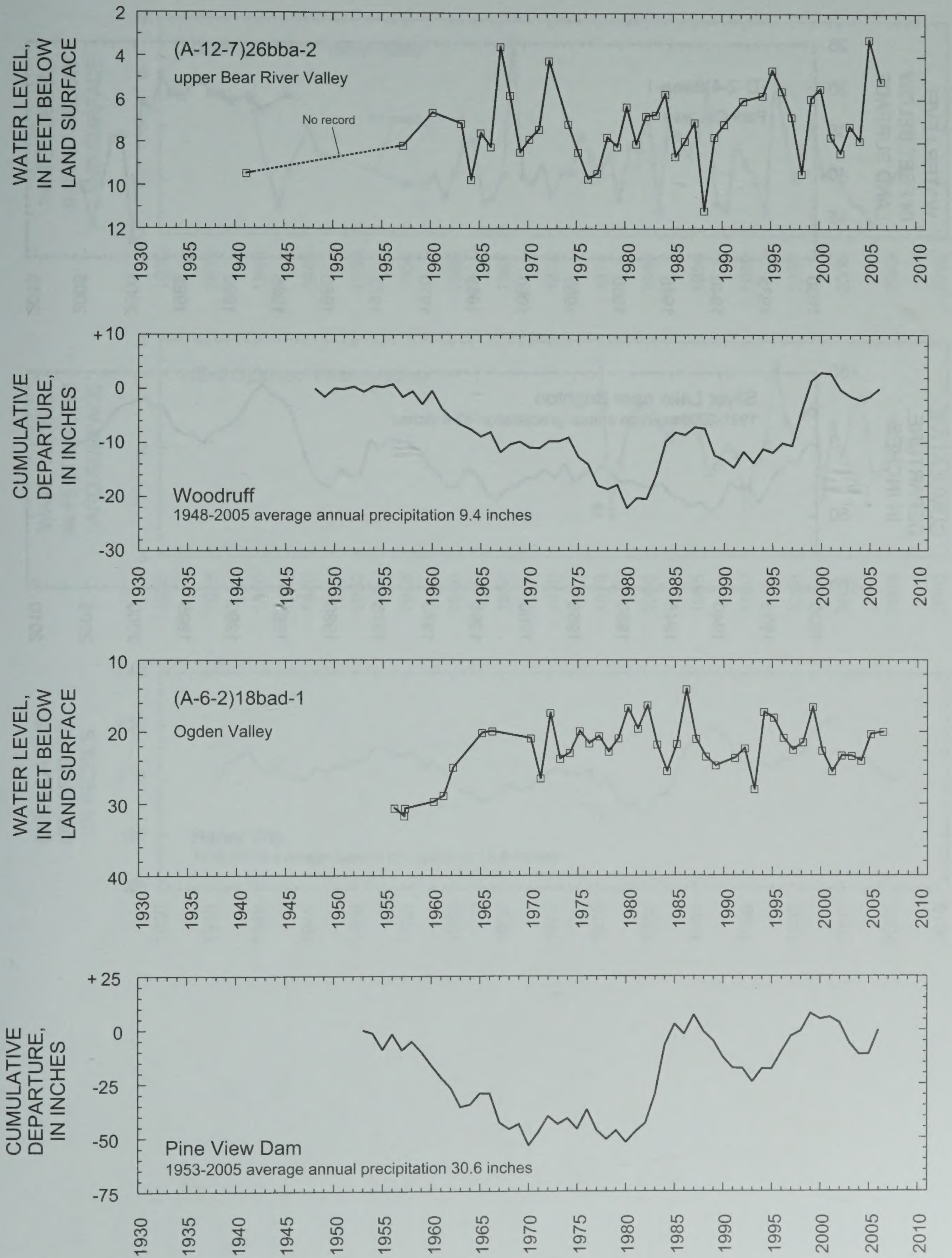
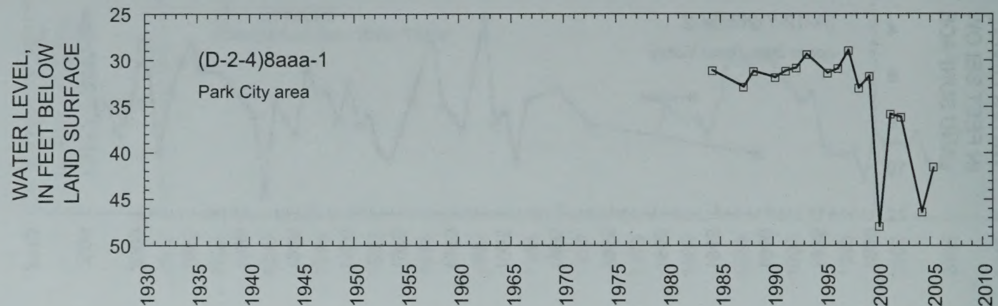


Figure 38. Relation of water level in wells in selected areas of Utah to cumulative departure from average annual precipitation at sites in or near those areas—Continued.



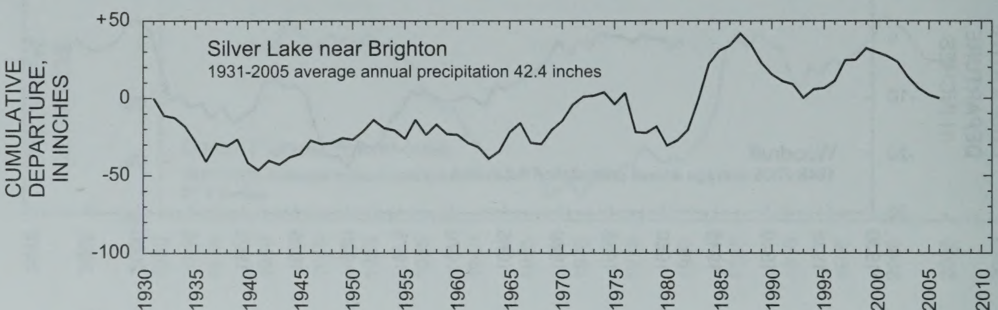


Figure 38. Relation of water level in wells in selected areas of Utah to cumulative departure from average annual precipitation at sites in or near those areas—Continued.

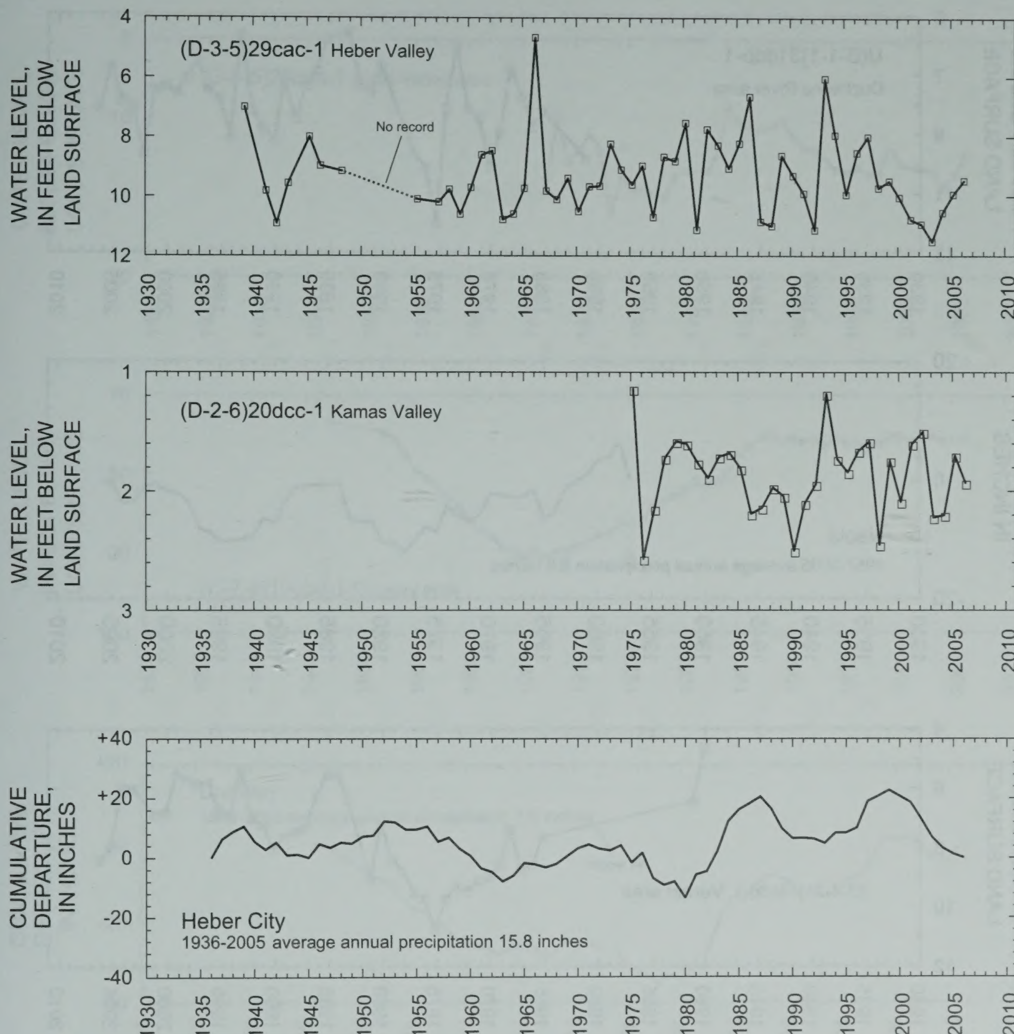


Figure 38. Relation of water level in wells in selected areas of Utah to cumulative departure from average annual precipitation at sites in or near those areas—Continued.

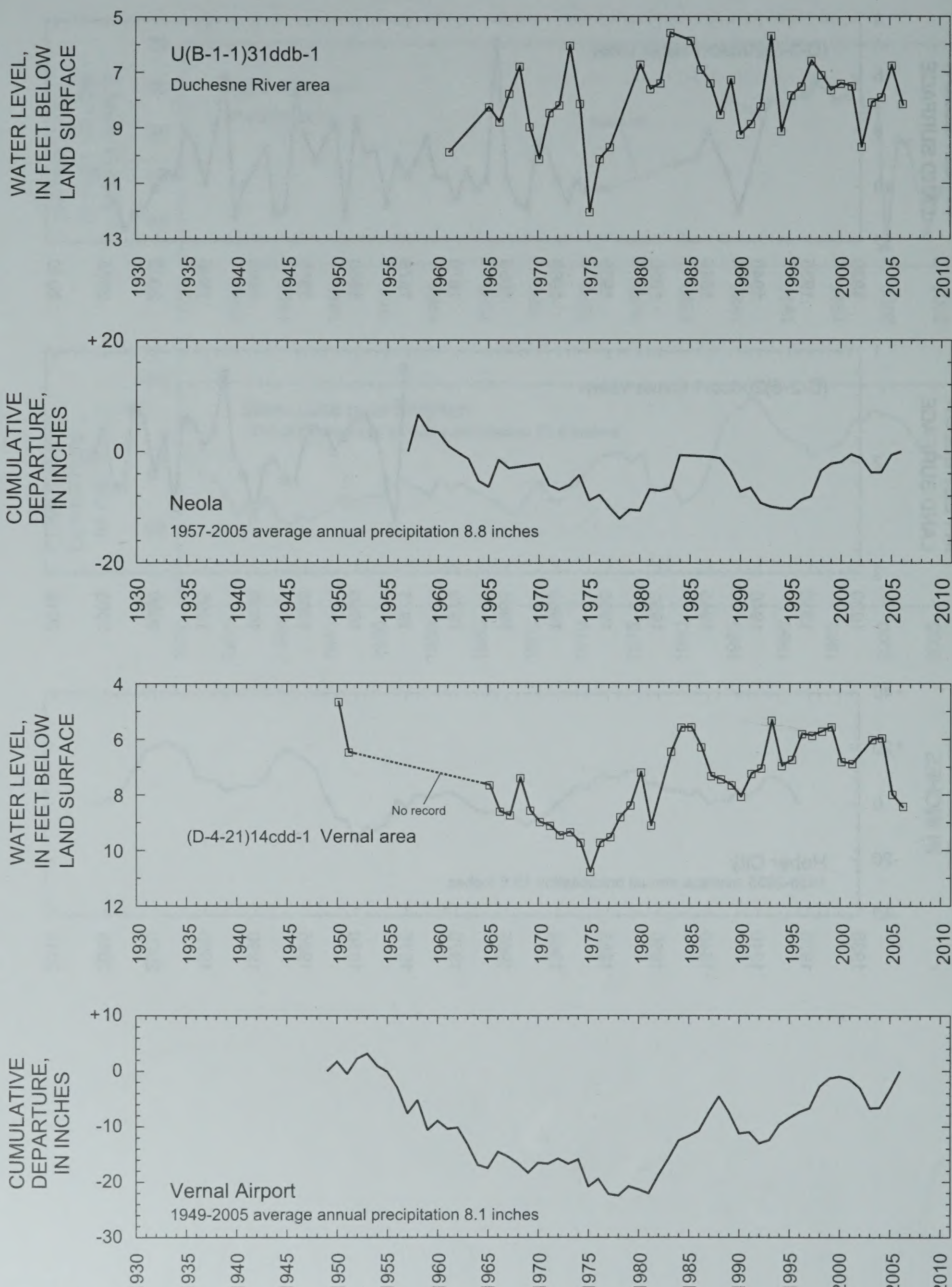


Figure 38. Relation of water level in wells in selected areas of Utah to cumulative departure from average annual precipitation at sites in or near those areas—Continued.

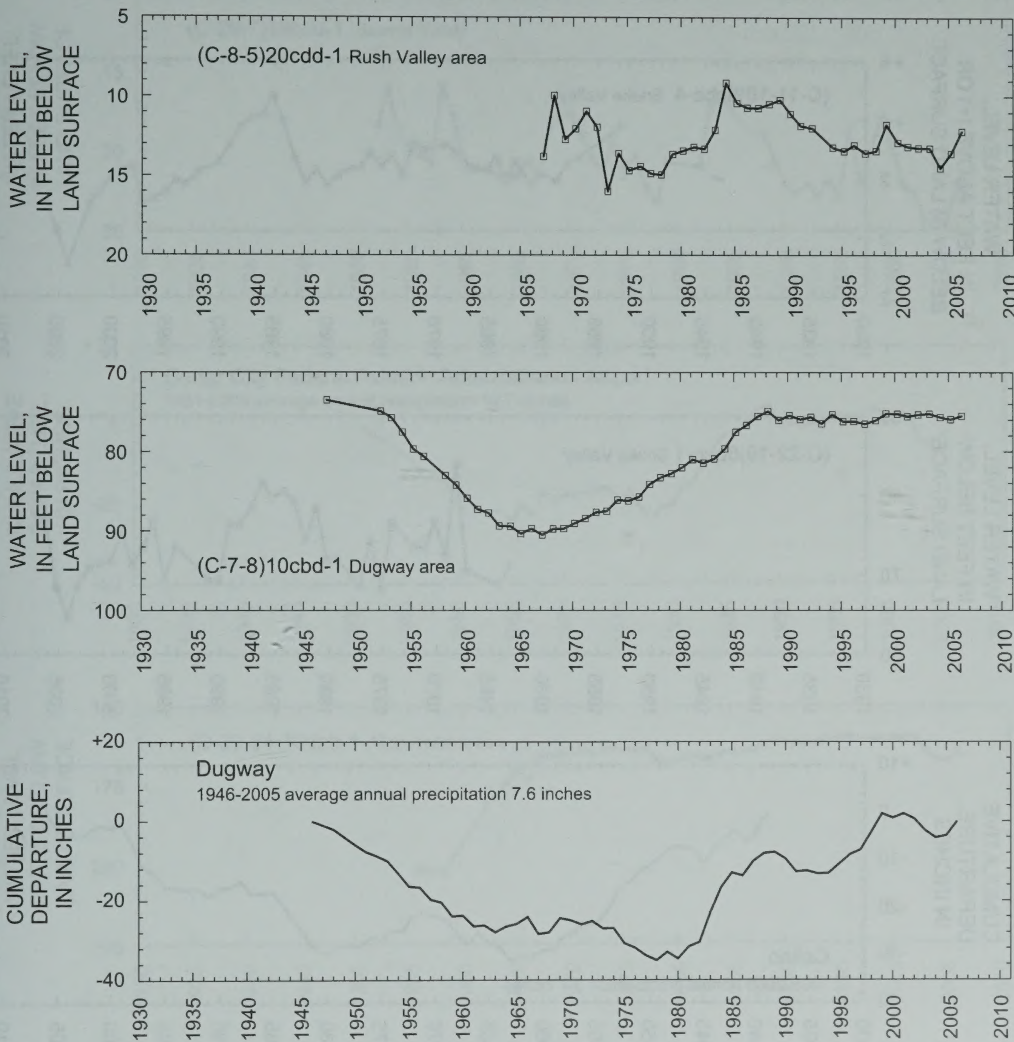


Figure 38. Relation of water level in wells in selected areas of Utah to cumulative departure from average annual precipitation at sites in or near those areas—Continued.

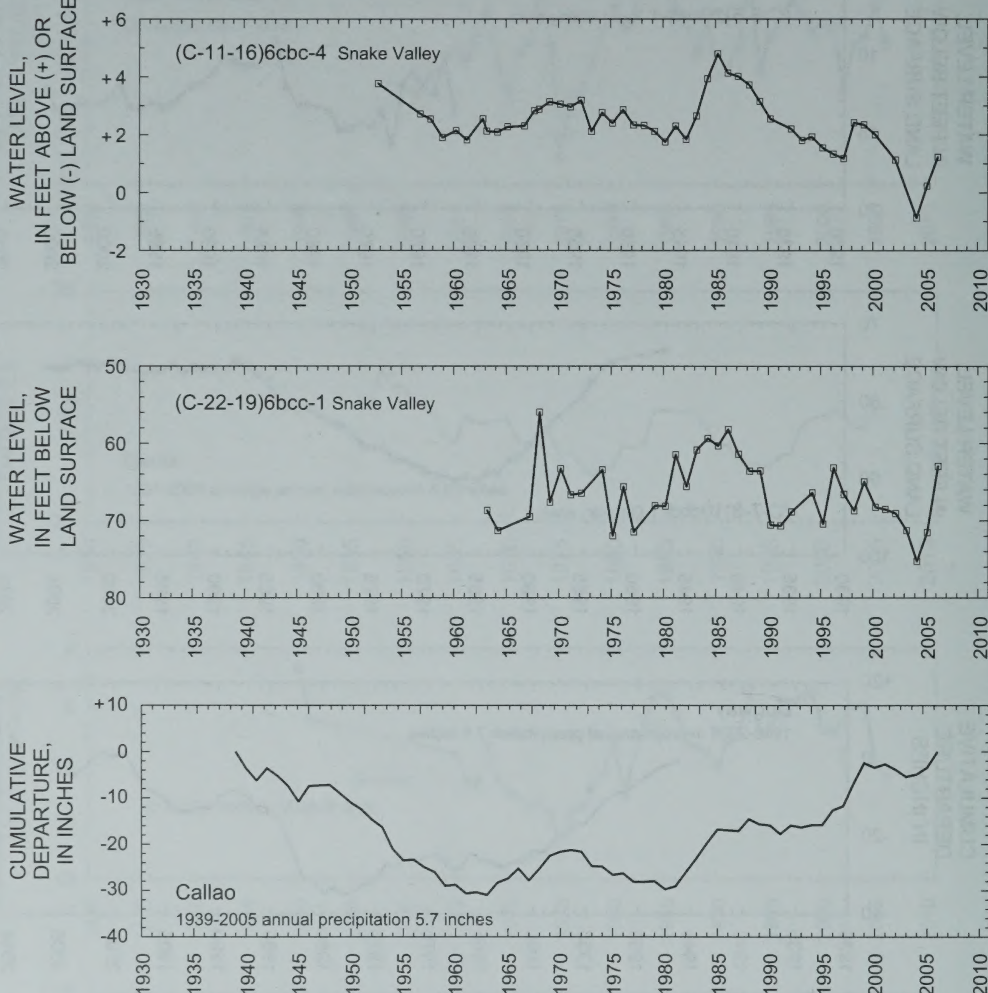


Figure 38. Relation of water level in wells in selected areas of Utah to cumulative departure from average annual precipitation at sites in or near those areas—Continued.

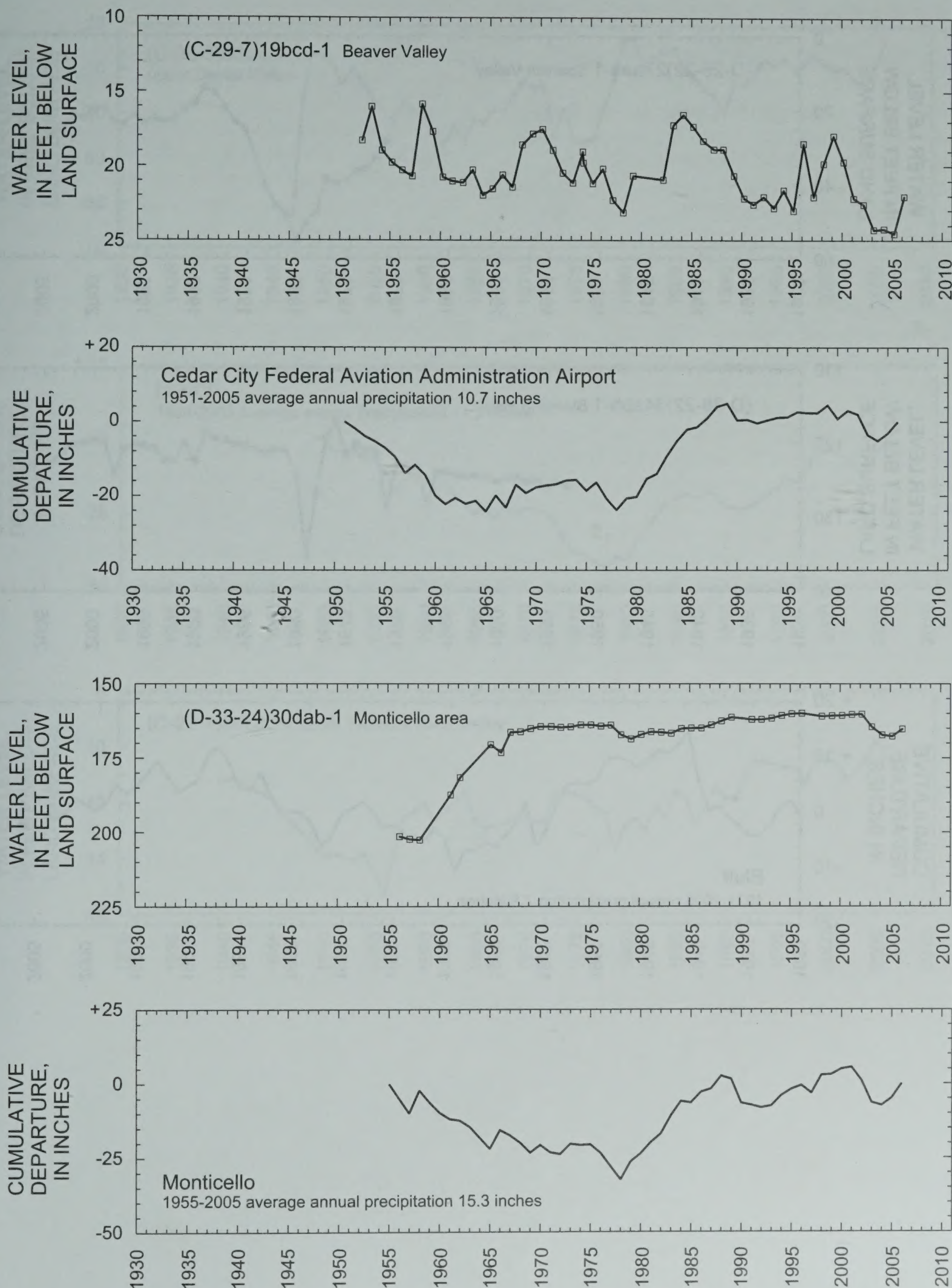


Figure 38. Relation of water level in wells in selected areas of Utah to cumulative departure from average annual precipitation at sites in or near those areas—Continued.

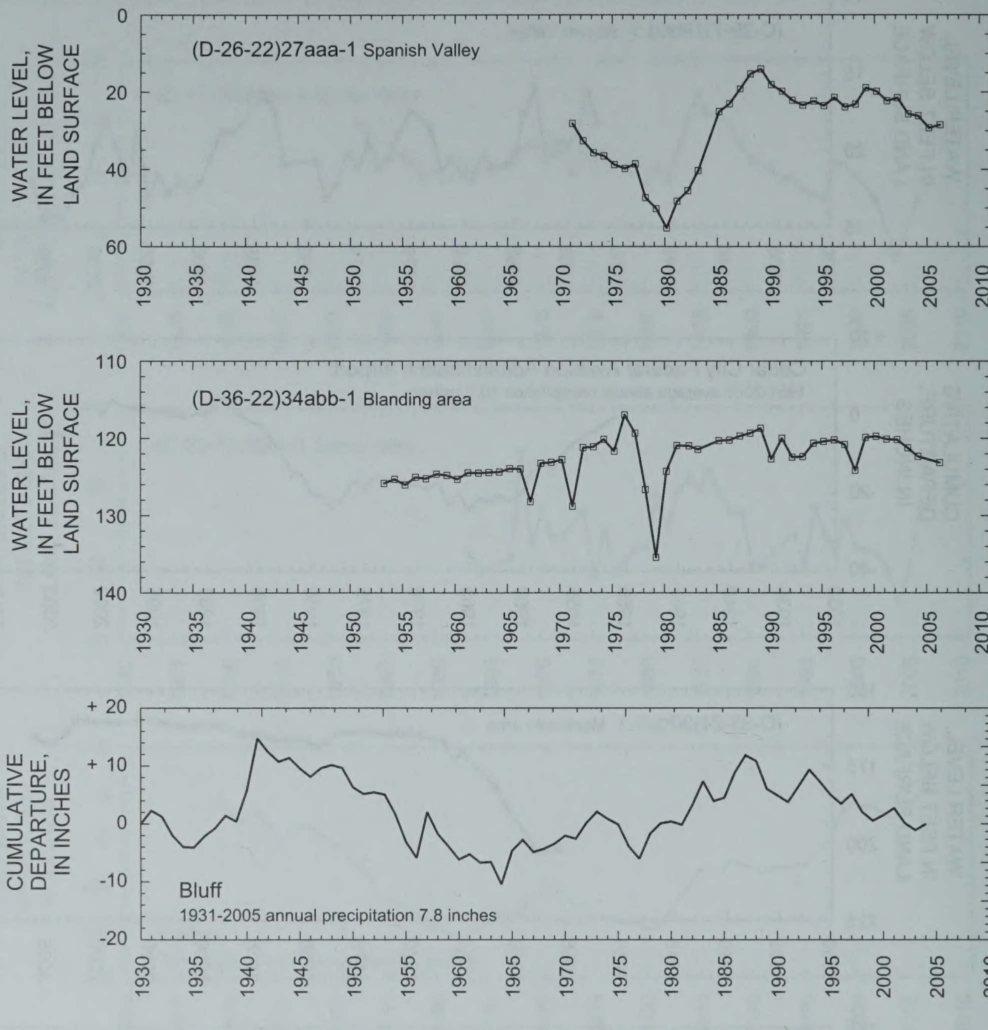


Figure 38. Relation of water level in wells in selected areas of Utah to cumulative departure from average annual precipitation at sites in or near those areas—Continued.

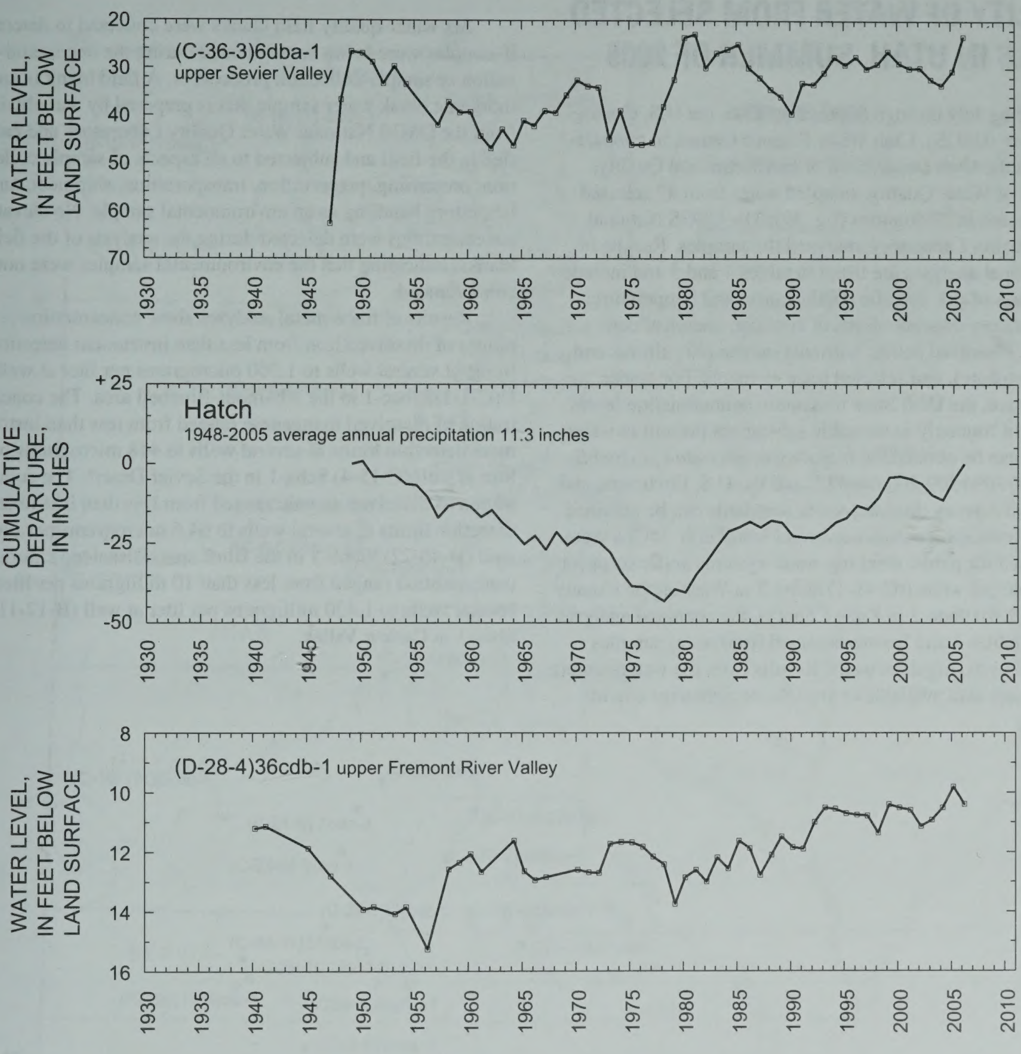


Figure 38. Relation of water level in wells in selected areas of Utah to cumulative departure from average annual precipitation at sites in or near those areas—Continued.

QUALITY OF WATER FROM SELECTED WELLS IN UTAH, SUMMER OF 2005

During July through September 2005, the U.S. Geological Survey (USGS), Utah Water Science Center, in cooperation with the Utah Department of Environmental Quality, Division of Water Quality, sampled water from 47 selected wells located in 17 counties (fig. 39). The USGS National Water Quality Laboratory analyzed the samples. Results of the chemical analyses are listed in tables 4 and 5 and include field values of pH, specific conductance, and temperature; and laboratory concentrations of common chemical constituents, dissolved solids, nutrients (nitrite plus nitrate, and orthophosphate), and selected trace elements. For reader convenience, the Utah State maximum contamination levels (MCLs) of routinely measurable substances present in water supplies can be obtained at *http://www.rules.utah.gov/publicat/code/r309/r309-200.htm#T5*, and the U.S. Environmental Protection Agency drinking-water standards can be obtained at *http://www.epa.gov/safewater/mcl.html#mcls*. MCLs were established for public drinking-water systems and, except for two municipal wells ((C-41-17)8cbd-2 in Washington County and (C-42-6)19bdc-2 in Kane County), the chemical analyses listed in tables 4 and 5 were obtained from water samples collected from irrigation wells. Results from the water-sample analyses are also available at *http://waterdata.usgs.gov/ut/nwis/qw*.

Six water-quality field blanks were collected to determine if samples were being contaminated during the decontamination or sample-collection procedures. A field blank is an inorganic blank water sample that is prepared by and obtained from the USGS National Water Quality Laboratory and carried in the field and subjected to all aspects of sample collection, processing, preservation, transportation, shipment, and laboratory handling as an environmental sample. No elevated concentrations were detected during the analysis of the field blanks, indicating that the environmental samples were not contaminated.

Results of trace-metal analyses show concentration ranges of dissolved iron from less than instrument detection limits at several wells to 1,960 micrograms per liter at well U(C-1-1)33bcc-1 in the Altamont-Bluebell area. The concentration of dissolved manganese ranged from less than instrument detection limits at several wells to 448 micrograms per liter at well (C-15-4) 8cba-1 in the Sevier Desert. The concentration of dissolved arsenic ranged from less than instrument detection limits at several wells to 64.6 micrograms per liter at well (D-40-22)30bbb-1 in the Bluff area. Dissolved chloride concentration ranged from less than 10 milligrams per liter at several wells to 1,420 milligrams per liter at well (B-12-11) 4bcc-1 in Curlew Valley.

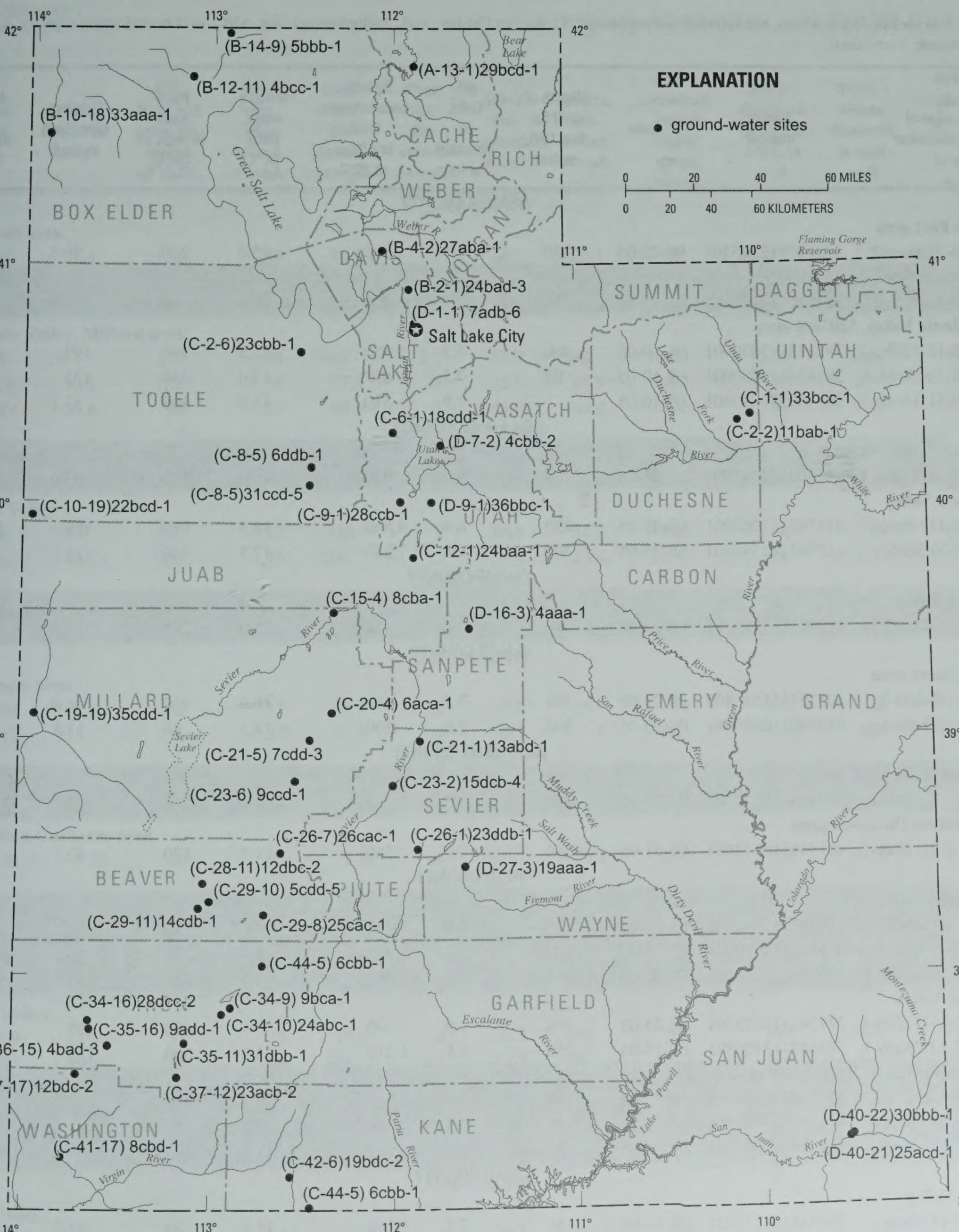


Figure 39. Location of ground-water sites sampled during the summer of 2005.

Table 4. Physical properties and concentration of major ions in water samples collected from selected wells in Utah, summer of 2005

[LSD, land surface datum; µS/cm, microsiemens per centimeter; °C, degrees Celsius; mg/L, milligrams per liter; ANC, acid neutralization capacity; <, less than; e, estimated; —, no data]

Local identifier	Station number	Date	Depth of well below LSD, in feet	pH, field, in standard units	Specific conductance, field, in µS/cm at 25°C	Temperature, field, in °C	Hardness, in mg/L as $CaCO_3$	Calcium, dissolved, in mg/L	Magnesium, dissolved, in mg/L
BEAVER COUNTY									
Cove Fort area									
(C-26-7)26cac-1	383101112365301	08-22-05	250	8.1	595	15.0	260	80.5	14.8
Beaver Valley									
(C-29-8)25cac-1	381516112422201	08-15-05	250	7.7	306	19.0	98	31.1	4.99
Escalante Valley, Milford area									
(C-28-11)12dbc-2	382313113020901	08-10-05	460	7.2	1,930	17.5	780	197	69.4
(C-29-10) 5cdd-2	381835113000001	08-10-05	95	7.5	850	15.0	460	135	28.5
(C-29-11)14cdb-1	381700113033401	08-10-05	—	7.9	510	18.0	190	53.1	15.1
BOX ELDER COUNTY									
Grouse Creek Valley									
(B-10-18)33aaa-1	413300113543001	08-24-05	84	6.8	980	12.0	320	95.0	21.2
Curlew Valley									
(B-12-11) 4bcc-1	414745113063901	08-25-05	230	6.8	4,830	18.5	910	198	102
(B-14-9) 5bbb-1	415847112540401	08-25-05	300	7.6	1,240	17.5	440	126	29.5
CACHE COUNTY									
Cache Valley									
(A-13-1)29bcd-1	415020111520401	08-25-05	173	7.8	454	15.0	200	42.5	23.4
DAVIS COUNTY									
East Shore area									
(B-2-1)24bad-3	405351111540803	08-23-05	386	7.5	496	16.0	120	36.9	7.72
(B-4-2)27aba-1	410340112030001	08-23-05	304	7.8	590	18.5	45	11.8	3.68
DUCHESNE COUNTY									
Altamont-Bluebell area									
U(C-1-1)33bcc-1	402114110003301	08-31-05	220	7.6	1,620	14.0	730	202	54.4
Starvation-Duchesne area									
U(C-2-2)11bab-1	401946110044601	08-31-05	666	7.2	360	14.5	170	43.5	15.8
IRON COUNTY									
Parowan Valley									
(C-32-8)12bdb-1	380218112424401	08-23-05	—	7.9	422	19.0	170	50.2	10.7
(C-34-9) 9bca-1	375147112530001	08-22-05	600	—	482	11.5	270	55.5	31.9
(C-34-10)24abc-1	375006112554801	09-08-05	162	7.4	462	13.5	230	45.9	28.2
Cedar Valley									
(C-35-11)31dbd-1	374248113075201	08-23-05	298	7.9	990	—	650	127	80.1
(C-37-12)23acb-1	373407113100801	08-17-05	250	7.9	1,210	13.5	600	135	63.3
Escalante Valley, Beryl-Enterprise area									
(C-34-16)28dcc-2	374834113384301	08-22-05	148	7.5	1,000	12.5	480	147	26.9
(C-35-16) 9add-1	374623113381301	08-22-05	150	7.5	478	12.5	220	68.0	12.2
(C-36-15) 4bad-3	374209113322203	09-08-05	320	7.8	765	21.5	150	47.7	6.61
JUAB COUNTY									
Juab Valley									
(C-12-1)24baa-1	394545111531001	08-04-05	66	7.2	1,240	14.8	350	82.7	34.9
KANE COUNTY									
Kanab area									
(C-42-6)19bdc-2	370843112340602	08-23-05	250	8.0	263	14.0	130	24.2	16.4
(C-44-5) 6cbb-1	370050112274501	08-23-05	80	7.1	1,930	18.0	750	189	68.5
MILLARD COUNTY									
Sevier Desert									
(C-15-4) 8cba-1	393154112192901	08-31-05	203	7.1	3,450	14.0	990	214	111

Table 4. Physical properties and concentration of major ions in water samples collected from selected wells in Utah, summer of 2005—Continued

Potassium, dissolved, in mg/L	Sodium, dissolved, in mg/L	ANC, fixed end point, lab, in mg/L as $CaCO_3$	Bromide, dissolved, in mg/L	Chloride, dissolved, in mg/L	Fluoride, dissolved, in mg/L	Silica, dissolved, in mg/L	Sulfate, dissolved, in mg/L	Solids, dissolved, sum of constituents, in mg/L	Solids, dissolved, residue at 180°C, in mg/L	Nitrite + nitrate, dissolved, in mg/L as N	Orthophosphate, dissolved, in mg/L as P
BEAVER COUNTY											
Cove Fort area											
2.89	21.4	151	.30	84.8	.2	44.5	25.1	371	411	1.23	.13
Beaver Valley											
8.07	20.3	102	.10	5.90	.8	74.4	40.3	248	250	<.06	<.02
Escalante Valley, Milford area											
19.8	167	140	.99	401	2.1	53.0	238	1,380	1,620	33.6	e.01
5.16	30.1	151	.34	67.4	.3	35.9	85.9	492	580	2.84	.03
5.29	29.8	94	.23	60.9	.5	43.0	60.0	330	349	1.26	<.02
BOX ELDER COUNTY											
Grouse Creek Valley											
8.28	42.7	173	.30	89.7	.3	55.5	63.8	482	521	.46	e.02
Curlew Valley											
23.1	555	152	1.14	1,420	.3	50.4	51.3	2,500	2,840	.69	<.02
12.6	44.7	109	.33	269	.2	58.4	23.4	637	766	1.77	<.02
CACHE COUNTY											
Cache Valley											
1.68	25.6	179	e.02	7.82	.1	11.4	10.3	231	218	.13	<.02
DAVIS COUNTY											
East Shore area											
1.04	62.4	132	.17	32.1	.2	17.9	29.1	275	300	1.88	.03
5.43	115	250	.27	40.9	.4	32.3	.6	363	374	<.06	.56
DUCHESNE COUNTY											
Altamont-Bluebell area											
3.47	117	102	.29	e.72	1.4	8.67	784	—	1,330	<.06	<.02
Starvation-Duchesne area											
3.50	9.22	126	.22	1.34	.6	10.5	49.2	210	212	<.06	<.02
IRON COUNTY											
Parowan Valley											
6.23	16.4	111	.34	43.2	.2	58.3	25.7	285	297	1.76	<.02
2.79	9.44	210	.21	10.5	.1	28.6	31.4	306	317	2.01	<.02
4.28	17.3	194	.28	24.3	.3	44.0	27.0	316	299	1.78	<.02
Cedar Valley											
2.69	12.2	81	.19	15.0	.2	22.3	446	765	869	2.35	<.02
1.94	49.4	118	.76	105	e.1	19.9	361	815	876	1.77	<.02
Escalante Valley, Beryl-Enterprise area											
8.70	36.2	74	.97	217	.6	65.0	102	656	847	1.66	<.02
4.93	15.4	136	.35	52.5	.2	53.1	21.8	318	328	1.77	e.01
4.34	105	160	.32	38.1	1.6	57.0	158	519	528	.90	e.01
JUAB COUNTY											
Juab Valley											
4.21	109	181	.30	195	.2	29.1	80.2	669	702	5.67	.02
KANE COUNTY											
Kanab area											
2.16	3.65	117	.15	3.31	e.1	14.8	4.1	149	139	2.24	<.02
9.79	247	194	.36	53.7	.5	15.1	833	1,530	1,700	.14	<.02
MILLARD COUNTY											
Sevier Desert											
8.28	338	264	.76	635	.2	28.0	541	2,040	2,270	.69	<.02

Table 4. Physical properties and concentration of major ions in water samples collected from selected wells in Utah, summer of 2005—Continued

Local identifier	Station number	Date	Depth of well below LSD, in feet	pH, field, in standard units	Specific conductance, field, in µS/cm at 25°C	Temperature, field, in °C	Hardness, in mg/L as $CaCO_3$	Calcium, dissolved, in mg/L	Magnesium, dissolved, in mg/L
Snake Valley									
(C-19-19)35cdd-1	390617113571601	07-21-05	500	7.4	460	14.5	190	45.9	18.9
Pahvant Valley									
(C-20-4) 6aca-1	390628112201401	08-24-05	506	7.4	1,460	13.5	840	204	81.4
(C-21-5) 7cdd-3	385939112272303	08-25-05	—	7.2	1,250	12.5	560	124	60.5
(C-23-6) 9ccd-1	384910112321401	08-25-05	136	7.0	3,650	16.0	1100	288	91.6
SALT LAKE COUNTY									
Salt Lake Valley									
(D-1-1) 7abd-6	404506111523301	07-27-05	130	6.9	1,370	15.5	590	144	56.0
SAN JUAN COUNTY									
Bluff area									
(D-40-21)25acd-1	371657109331901	08-10-05	450	8.7	430	17.0	11	3.05	.816
(D-40-22)30bbb-1	371716109325501	08-10-05	825	9.0	800	20.5	4	1.15	.381
SANPETE COUNTY									
Sanpete Valley									
(D-16-3) 4aaa-1	392740111345301	08-04-05	160	7.2	1,030	14.3	330	69.2	39.2
SEVIER COUNTY									
Central Sevier Valley									
(C-21-1)13abd-1	385910111512101	08-08-05	291	7.9	750	18.5	160	32.8	18.2
(C-23-2)15dcb-4	384757112002201	08-08-05	75	7.5	670	15.5	360	73.0	42.0
(C-26-1)23ddb-1	383140111522001	08-08-05	200	8.5	210	12.5	85	28.1	3.59
TOOELE COUNTY									
Tooele Valley									
(C-2-6)23cbb-1	403802112301201	08-23-05	210	7.8	955	—	200	45.9	20.3
Rush Valley									
(C-8-5) 6ddb-1	400849112263901	07-26-05	534	8.2	665	13.5	230	44.0	28.7
(C-8-5)31ccd-5	400418112271701	07-26-05	60	6.8	1,440	11.5	540	166	30.4
Snake Valley									
(C-10-19)22bcd-1	395633113584301	07-20-05	130	7.2	285	15.0	84	24.9	5.40
UTAH COUNTY									
Cedar Valley									
(C-6-1)18cdd-1	401730111594501	08-09-05	471	7.4	738	29.5	280	70.1	26.6
Northern Utah Valley									
(D-7-2) 4cbb-2	401414111435301	08-26-05	144	7.6	540	13.0	260	64.6	24.5
Southern Utah Valley									
(D-9-1)36bbc-1	395942111470801	08-23-05	386	7.0	520	11.0	260	67.2	23.1
Goshen Valley									
(C-9-1)28ccb-1	395956111572101	08-12-05	802	7.2	1,760	19.0	520	138	43.5
WASHINGTON COUNTY									
Escalante Valley, Beryl-Enterprise area									
(C-37-17)12bdc-2	373456113423501	09-07-05	290	7.2	439	9.5	200	60.5	10.8
Central Virgin River area									
(C-41-17) 8cbd-2	371348113470301	09-07-05	1000	7.3	467	19.0	240	67.4	16.6
WAYNE COUNTY									
Upper Fremont River Valley									
(D-27-3)19aaa-1	382717111365601	08-08-05	285	7.4	1,140	11.0	770	230	46.8

Table 4. Physical properties and concentration of major ions in water samples collected from selected wells in Utah, summer of 2005—Continued

Potassium, dissolved, in mg/L	Sodium, dissolved, in mg/L	ANC, fixed end point, lab, in mg/L as $CaCO_3$	Bromide, dissolved, in mg/L	Chloride, dissolved, in mg/L	Fluoride, dissolved, in mg/L	Silica, dissolved, in mg/L	Sulfate, dissolved, in mg/L	Solids, dissolved, sum of constituents, in mg/L	Solids, dissolved, residue at 180°C, in mg/L	Nitrite + nitrate, dissolved, in mg/L as N	Orthophosphate, dissolved, in mg/L as P
Snake Valley											
2.47	19.1	179	.20	23.1	.3	23.3	19.1	261	265	.18	<.02
Pahvant Valley											
3.81	72.9	130	.74	288	.3	23.3	235	1,020	1,080	7.54	<.02
4.71	120	148	—	161	.2	28.7	225	837	983	5.52	<.02
54.7	502	155	1.60	947	1.4	40.9	628	2,660	2,960	2.55	<.02
SALT LAKE COUNTY											
Salt Lake Valley											
3.01	54.6	165	.26	162	.2	20.0	175	738	844	5.49	.03
SAN JUAN COUNTY											
Bluff area											
1.32	95.5	174	.17	2.19	e.1	10.6	46.2	264	277	<.06	<.02
1.11	177	354	.25	14.8	.5	10.4	50.7	469	489	<.06	<.02
SANPETE COUNTY											
Sanpete Valley											
7.68	99.8	252	.31	95.8	.2	45.3	91.1	607	666	<.06	<.02
SEVIER COUNTY											
Central Sevier Valley											
4.44	93.5	113	.17	107	.6	42.5	87.7	456	453	.25	<.02
3.36	20.4	269	.23	33.2	.4	34.1	51.2	423	418	.75	e.02
2.96	9.46	81	.11	11.7	.2	40.8	4.7	152	149	.36	<.02
TOOELE COUNTY											
Tooele Valley											
20.1	131	134	.29	236	.4	58.2	31.4	627	635	.81	e.01
Rush Valley											
2.72	39.5	138	.20	92.0	.6	14.2	30.1	337	363	.39	<.02
1.77	50.2	78	.36	351	e.1	17.2	48.1	719	1,250	1.56	<.02
Snake Valley											
1.18	16.9	86	.12	17.2	.3	28.2	9.4	155	161	—	—
UTAH COUNTY											
Cedar Valley											
3.48	39.1	173	.20	71.4	.6	21.2	65.7	406	425	.87	<.02
Northern Utah Valley											
2.91	16.1	204	.24	11.9	.3	20.9	45.2	309	327	<.06	e.02
Southern Utah Valley											
1.57	7.66	162	.16	19.9	.2	17.4	20.1	263	300	1.94	<.02
Goshen Valley											
16.4	126	116	.73	379	.2	69.7	111	1,020	1,160	14.1	<.02
WASHINGTON COUNTY											
Escalante Valley, Beryl-Enterprise area											
4.00	21.2	177	.30	18.8	.2	38.4	14.5	291	288	3.50	.08
Central Virgin River area											
2.38	14.3	158	.17	12.9	.3	18.9	40.1	270	289	.42	<.02
WAYNE COUNTY											
Upper Fremont River Valley											
3.98	32.9	153	.17	12.2	e.1	28.6	593	1,050	1,150	2.53	.02

Table 5. Concentration of trace elements in water samples collected from selected wells in Utah, summer of 2005

[e, estimated; <, less than; µg/L, micrograms per liter]

Local identifier	Station number	Date	Arsenic, dis-solved, in µg/L	Iron, dissolved, in µg/L	Manga-nese, dissolved, in µg/L	Molyb-denum, dissolved, in µg/L	Selenium, dissolved, in µg/L	Uranium, dissolved, in µg/L
			BEAVER COUNTY					
Cove Fort area								
(C-26-7)26cac-1	383101112365301	08-22-05	2.7	7	.9	e.4	2.0	3.42
Beaver Valley								
(C-29-8)25cac-1	381516112422201	08-15-05	14.5	24	63.4	7.7	<.4	<.04
Escalante Valley, Milford area								
(C-28-11)12dbc-2	382313113020901	08-10-05	7.0	<18	52.3	13.6	2.6	4.00
(C-29-10) 5cdd-2	381835113000001	08-10-05	2.5	<6	<.6	.6	.9	42.5
(C-29-11)14cdb-1	381700113033401	08-10-05	5.3	<6	<.6	1.9	.6	4.38
			BOX ELDER COUNTY					
Grouse Creek Valley								
(B-10-18)33aaa-1	413300113543001	08-24-05	6.3	17	.9	5.2	.49	7.38
Curlew Valley								
(B-12-11) 4bcc-1	414745113063901	08-25-05	2.9	<18	<1.8	1.7	3.1	2.19
(B-14-9) 5bbb-1	415847112540401	08-25-05	1.8	<6	<.6	.8	.37	1.50
			CACHE COUNTY					
Cache Valley								
(A-13-1)29bcd-1	415020111520401	08-25-05	5.6	148	59.9	.8	e.4	.27
			DAVIS COUNTY					
East Shore area								
(B-2-1)24bad-3	405351111540803	08-23-05	.7	e5	6.9	2.7	e.4	2.80
(B-4-2)27aba-1	410340112030001	08-23-05	23.2	285	50.8	e.4	<.4	<.04
			DUCHESNE COUNTY					
Altamont-Bluebell area								
U(C-1-1)33bcc-1	402114110003301	08-31-05	3.3	1,960	40.4	4.3	<.08	.74
Starvation-Duchesne area								
U(C-2-2)11bab-1	401946110044601	08-31-05	e.1	222	11.9	.5	<.08	.12
			IRON COUNTY					
Parowan Valley								
(C-32-8)12bdb-1	380218112424401	08-23-05	2.7	<6	e.5	.7	1.7	2.04
(C-34-9) 9bca-1	375147112530001	08-22-05	2.1	<6	<.6	e.2	1.7	2.77
(C-34-10)24abc-1	375006112554801	09-08-05	5.3	6	.7	.9	.91	3.09
Cedar Valley								
(C-35-11)31dbd-1	374248113075201	08-23-05	1.1	e3	e.5	.5	2.2	2.96
(C-37-12)23acb-1	373407113100801	08-17-05	1.2	8	1.0	.5	10.0	1.79
Escalante Valley, Beryl-Enterprise area								
(C-34-16)28dcc-2	374834113384301	08-22-05	9.5	e5	<.6	.6	5.3	3.88
(C-35-16) 9add-1	374623113381301	08-22-05	3.2	<6	<.6	e.4	1.8	2.43
(C-36-15) 4bad-3	374209113322203	09-08-05	20.2	e4	<.6	8.7	.32	1.33
			JUAB COUNTY					
Juab Valley								
(C-12-1)24baa-1	394545111531001	08-04-05	1.3	<6	<.6	.6	4.0	1.80
			KANE COUNTY					
Kanab area								
(C-42-6)19bdc-2	370843112340602	08-23-05	1.0	e6	<.6	<.4	.5	.43
(C-44-5) 6cbb-1	370050112274501	08-23-05	.9	e10	139	5.9	1.7	1.38
			MILLARD COUNTY					
Sevier Desert								
(C-15-4) 8cba-1	393154112192901	08-31-05	<.4	168	448	e.6	<.8	e.04

Table 5. Concentration of trace elements in water samples collected from selected wells in Utah, summer of 2005—Continued

Local identifier	Station number	Date	Arsenic, dis-solved, in µg/L	Iron, dissolved, in µg/L	Manga-nese, dissolved, in µg/L	Molyb-denum, dissolved, in µg/L	Selenium, dissolved, in µg/L	Uranium, dissolved, in µg/L
MILLARD COUNTY—Continued								
Snake Valley								
(C-19-19)35cdd-1	390617113571601	07-21-05	5.0	7	<.6	1.8	.7	2.99
Pahvant Valley								
(C-20-4) 6aca-1	390628112201401	08-24-05	1.5	7	<.6	.5	2.2	.83
(C-21-5) 7cdd-3	385939112272303	08-25-05	2.1	8	<.6	1.2	2.5	3.01
(C-23-6) 9ccd-1	384910112321401	08-25-05	8.6	<18	<1.8	1.5	3.0	3.67
SALT LAKE COUNTY								
Salt Lake Valley								
(D-1-1) 7abd-6	404506111523301	07-27-05	.8	9	7.0	1.2	1.6	1.64
SAN JUAN COUNTY								
Bluff area								
(D-40-21)25acd-1	371657109331901	08-10-05	10.3	<6	6.9	.6	<.4	e.04
(D-40-22)30bbb-1	371716109325501	08-10-05	64.6	7	1.6	1.5	<.4	.33
SANPETE COUNTY								
Sanpete Valley								
(D-16-3) 4aaa-1	392740111345301	08-04-05	12.9	6,900	31.6	.7	<.4	3.94
SEVIER COUNTY								
Central Sevier Valley								
(C-21-1)13abd-1	385910111512101	08-08-05	10.5	<6	<.6	3.7	.7	4.40
(C-23-2)15dcb-4	384757112002201	08-08-05	3.9	e4	<.6	3.7	1.4	5.54
(C-26-1)23ddb-1	383140111522001	08-08-05	3.8	<6	<.6	.6	e.2	2.45
TOOELE COUNTY								
Tooele Valley								
(C-2-6)23cbb-1	403802112301201	08-23-05	5.4	<6	<.6	.8	1.0	.95
Rush Valley								
(C-8-5) 6ddb-1	400849112263901	07-26-05	11.0	<6	<.6	2.4	.6	1.54
(C-8-5)31ccd-5	400418112271701	07-26-05	.9	7	e.6	e.2	1.4	1.70
Snake Valley								
(C-10-19)22bcd-1	395633113584301	07-20-05	.8	<6	<.6	1.1	.4	11.9
UTAH COUNTY								
Cedar Valley								
(C-6-1)18cdd-1	401730111594501	08-09-05	4.6	<6	<.6	2.3	1.2	1.73
Northern Utah Valley								
(D-7-2) 4cbb-2	401414111435301	08-26-05	1.7	643	73.2	1.0	<.08	<.04
Southern Utah Valley								
(D-9-1)36bbc-1	395942111470801	08-23-05	.5	<6	<.6	.6	1.4	1.35
Goshen Valley								
(C-9-1)28ccb-1	395956111572101	08-12-05	4.2	<6	<.6	1.8	5.6	4.93
WASHINGTON COUNTY								
Escalante Valley, Beryl-Enterprise area								
(C-37-17)12bdc-2	373456113423501	09-07-05	3.2	<6	e.4	.5	2.0	2.54
Central Virgin River area								
(C-41-17) 8cbd-2	371348113470301	09-07-05	25.9	e4	2.8	5.7	.34	1.47
WAYNE COUNTY								
Upper Fremont River Valley								
(D-27-3)19aaa-1	382717111365601	08-08-05	1.3	10	.7	e.3	1.0	17.3

REFERENCES CITED

National Oceanic and Atmospheric Administration, 2005, Climatological data, Utah: Asheville, N.C., National Climatic Data Center, v. 107, no. 1-12 [variously paged].

Burden, C.B., and others, 2005, Ground-water conditions in Utah, spring of 2005: Utah Division of Water Resources Cooperative Investigations Report No. 46, 138 p.

U.S. GOVERNMENT PRINTING OFFICE: 2006 — 560-094 / 18003 Region No. 8

STATE OF UTAH
NATURAL RESOURCES
Division of Water Resources